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The AUTOMOBILE

Eight-Cylinder Motor for 1915

Cadillac Introduces French Motor Design as Stock for Next Year—V-Type Adopted—Gives Steady Torque

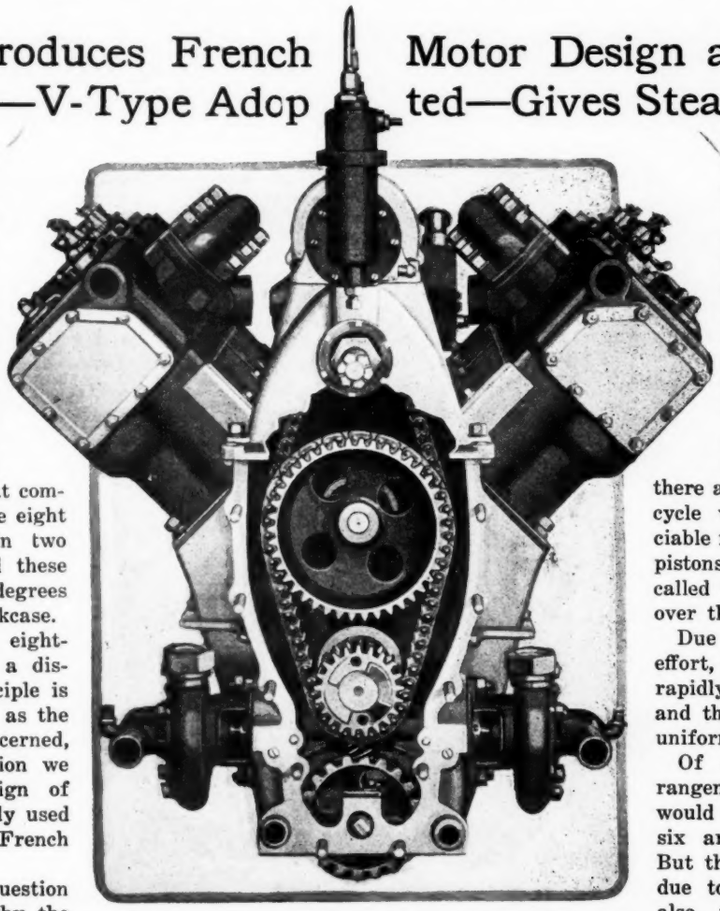
FOR next year the Cadillac Motor Car Co. is using an eight-cylinder motor as its stock equipment, this marking the début of this type of motor in the stock-car field in America. The motor is what has been known as the V-type developed some years ago by the DeDion Bouton company in France, and marketed since then by that company as stock models. The eight cylinders are arranged in two groups of four each, and these groups are mounted at 90 degrees to each other on the crankcase.

Although an American eight-cylinder motor comes as a distinct innovation, the principle is now new, not even so far as the automobile industry is concerned, and if we turn to aviation we will find that this design of motor has been successfully used by one of the best known French makers.

Naturally, the first question which will be asked is why the addition of two cylinders will make such a justifiable difference in performance as compared with a six. In the eight there are eight power impulses during each complete cycle of two crankshaft revolutions; that is, there is a power impulse every quarter turn of the crankshaft and thus there is no intermission between them, but rather an overlapping so complete that the turning effort is practically constant. In the six there is a power impulse every one-third revolution of the crankshaft, and though there is always a turning effort upon the crankshaft, it has more fluctuation due to the longer interval between impulses. In the four-cylinder engine an impulse occurs every half revolution, and there are obviously periods in the cycle when there is no appreciable force exerted by any of the pistons. The flywheel is then called upon to carry the shaft over these power lapses.

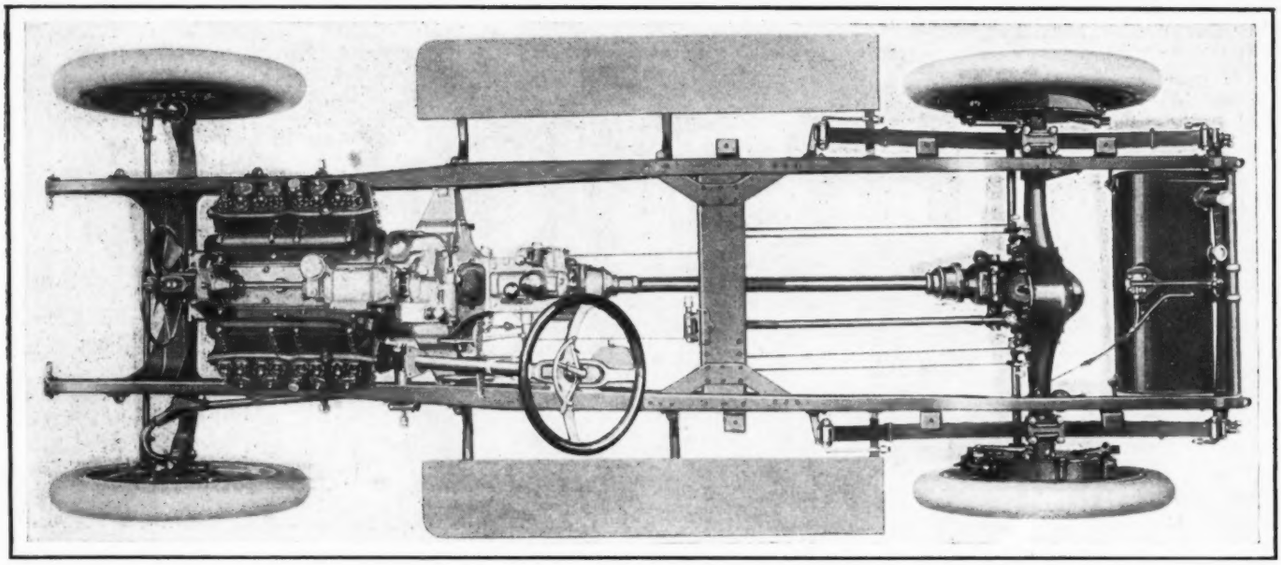
Due to this continuous turning effort, the six-cylinder motor has rapidly come into prominence, and the eight has an even more uniform torque.

Of course, the simplest arrangement of eight cylinders would be all in line just as the six are arranged or the four. But this would be impracticable, due to the extreme length and also to the abnormally long crankshaft which would be necessitated, while the crankcase for such an engine would be very heavy. To eliminate these difficulties the cylinders are arranged in two sets of four opposite to each other at an angle of 90 degrees, the same angle as it would be necessary to set the two series of four crankshaft throws were the cylinders arranged all in line. This placing of the cylinders in



CADILLAC EIGHT-CYLINDER MOTOR FOR 1915

This photographic reproduction shows the front end of the new Cadillac eight-cylinder motor, which the company will use in its 1915 cars. There are two groups of cylinders, each a block casting of four cylinders, mounted at 90 degrees to each other. The cylinders are 3 1-8-inch bore and 5 1-8-inch stroke. The piston displacement is 314 cubic inches; the horsepower rating is 31.28. In dynamometer tests the motor shows 70 horsepower at 2400 r.p.m. The crankshaft is identical in design with that used in a four-cylinder car, and the camshaft carries the same number of cams as in a four-cylinder design. This new motor weighs approximately 60 pounds less than the four-cylinder Cadillac engine used this year. There is but one carbureter used



CADILLAC CHASSIS FOR 1915, SHOWING EIGHT-CYLINDER MOTOR WITH UNIT GEARBOX

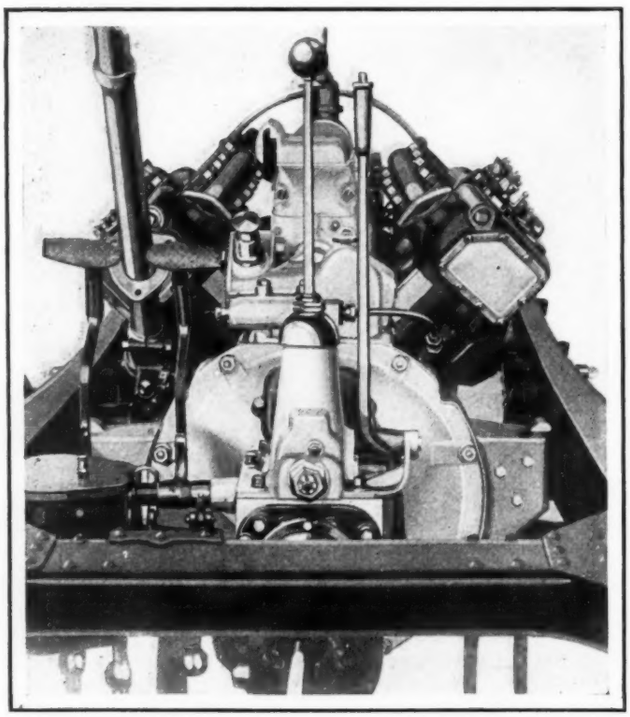
For next year the Cadillac company has discarded the four-cylinder motor and is using an eight-cylinder design, which gives a very compact power plant, one actually shorter than the four-cylinder predecessor. The small flywheel is entirely enclosed and the three-speed gearbox is a unit with the motor. For the first time this company has placed the steering wheel on the left with center control. A single-reduction Timken axle design is used with a set of spiral bevel gears instead of the conventional bevel type. The Delco electric system is continued. The wheelbase is 122 inches, or 2 inches longer than this year

sets at an angle of 90 degrees to each other gives the V form.

Arranged in this way, the eight-cylinder motor is no longer than a four-cylinder one of equal bore. As compared with a six, it has about 30 per cent. less length, resulting in a shorter crankcase—a weight reduction factor. In addition, its crankshaft is of the same form as that of a four, the throws being all in one plane, whereas those of a six crankshaft are in three planes, it is a simpler manufacturing job. Further, the shorter shaft is less given to periodic vibration, the camshaft is also shorter and less prone to whipping.

Considering the weight of a six and an eight, the shorter crankcase, shorter crankshaft and camshaft, lighter reciprocating parts and flywheel give the latter a distinct advantage, considering that both engines have the same power. In the Cadillac case, the new motor has proven to be fully 60 pounds lighter than the four-cylinder engine formerly used. This is because it is shorter and has lighter reciprocating parts.

Because each set of cylinders may be cooled separately and due to the angle of the jackets there is no chance for any of the water to get into pockets, the cooling of a V-shaped eight is superior to that of a six or a four. The natural tendency is for the water to flow upward through the jackets. Further, the water tends to rise to the hottest points of the jackets.



REAR VIEW CADILLAC MOTOR, SHOWING DELCO UNIT IN V CYLINDERS

The angular space between the two groups of cylinders affords ample space for the fan and tire pump in front, the carbureter near the middle and the Delco unit at the rear. There is a separate exhaust pipe for each cylinder group, the flanged ends on these pipes being shown. This illustration shows the compact gearbox, a unit with the motor. For next year a multiple-disk, dry-plate clutch is used, composed of fifteen high-carbon steel plates 7.75 inches in diameter. The set of plates driven by the flywheel are faced with wire-mesh asbestos

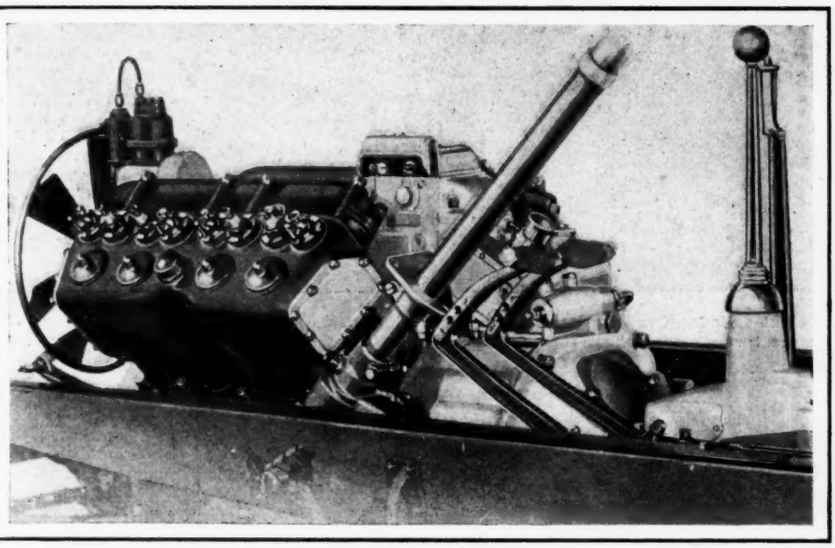
Aside from the purely mechanical advantages of the newest type of gasoline motor, the car owner is specially interested to know just how these above-mentioned advantages affect the working of the car so far as the actual driving of it is concerned. It is only natural for the average man to say to himself that perhaps the eight is theoretically superior to the six, but that when it comes to actual road work there is probably little difference.

On the Road

The writer must admit that prior to some actual road work with the new Cadillac he was somewhat inclined to be in the sceptical division and questioned the appreciable advantage of tacking on two extra cylinders. A 60-mile run over rolling country where hills abounded, some quite steep, resulted in complete conversion to the eight and great surprise at its performance, however.

Gearshifting proved to be almost an unnecessary operation, speeds anywhere from 2 1-2 to 55 or 60 miles an hour being attainable on

high gear. The quick acceleration from slow running to passenger train travel with no apparent effort whatever was truly remarkable. Bad stretches of road, turn outs for slow-moving vehicles and other traffic obstructions very rarely made it necessary to drop into second gear. Nor was this high gear driving done with any effort; the car controlled with the throttle alone just as if it were an electric responding to a current control lever. There was an undeniable feeling of security in driving the car, for the idea of killing the motor does not enter your mind the reserve power is so great.



THREE-QUARTER VIEW CADILLAC EIGHT-CYLINDER MOTOR FOR 1915

Each of the two cylinder castings contains four L-shaped cylinders. The intake valves are tulip shaped to permit of freer flow of gas into the cylinders. The exhaust valves are conventional poppet shapes. Over each cylinder bore is a removable cap which gives access to the waterjacket and to the combustion chamber. Between the second and third cylinder in each block the breather pipe is brought up through the cylinder casting. In rear of the fan is the power tire pump for tire inflation. The two groups of cylinders are mounted at 90 degrees on an aluminum crankcase

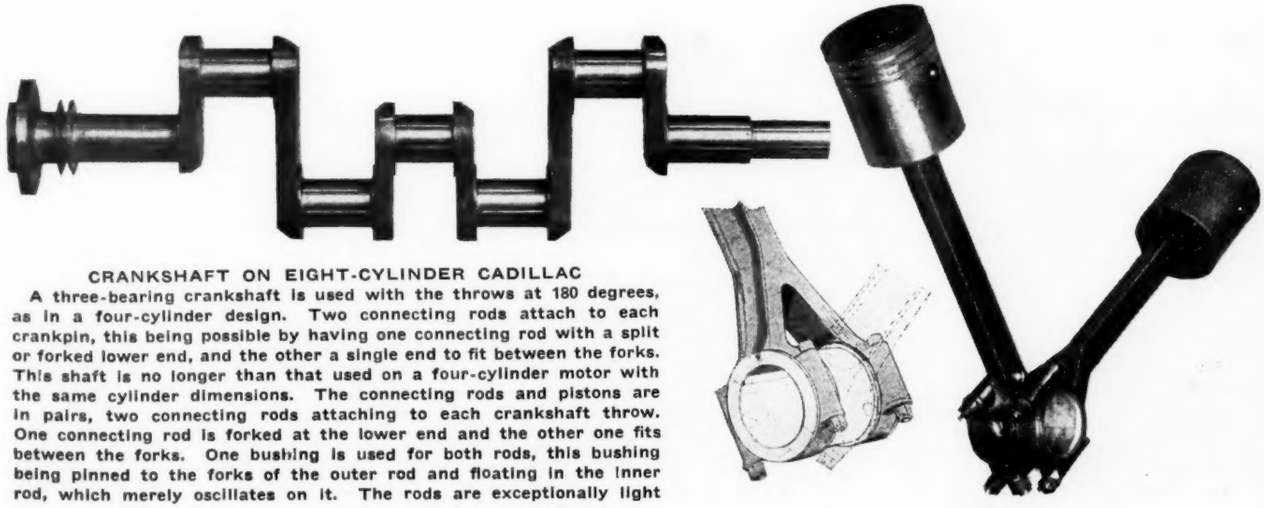
S. A. E. Horsepower 31.28

Considering the Cadillac motor in detail, one is struck with the high speed, high efficiency machine which has been produced almost without precedent or previous experience with this type. The two sets of four cylinders are each block cast and present much the same general appearance as any other block of four. The bore is 3 1-8 inches and the stroke 5 1-8 inches, giving a total piston displacement of 314 cubic inches. The S. A. E. formula, which is really not applicable to this motor, gives it a rating of 31.28 horsepower. On dynamometer tests it has developed 70 horsepower at 2,400 revolutions per minute. The power curve herewith serves to indicate the output at various speeds.

Connecting Rods in Pairs

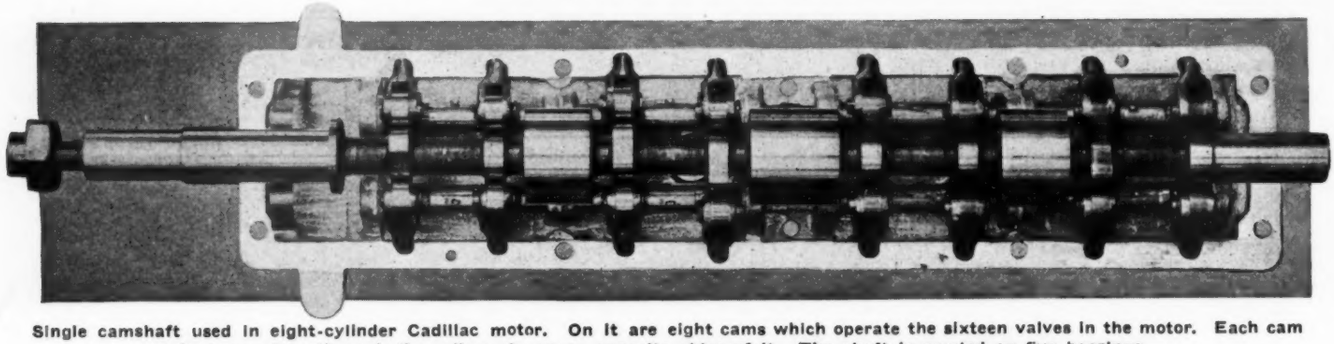
The blocks of cylinders bolt to the copper-alloy aluminum crankcase which is common to both and which is split horizontally into upper and lower sections, the lower portion being the oil base. The upper half carries the crankshaft which has three main bearings. Both sets of connecting-rods connect to this shaft, one throw bearing taking care of a pair of rod ends, in opposite cylinders. In order for both to fasten to the same bushing, one rod has a yoked end, the other rod end fitting within the yoke arms. Two caps are thus required for the yoke rod, one for each arm of the yoke. These fit around the outer part of the bushing, gripping it rigidly, due to the cap bolts and in addition pins go through the rod into the bushing so as to insure the two moving together. The other rod fits around the bushing within the yoke and is free to turn on the bushing. Thus in operation the bearing for the yoke-end rod is the inner surface of the bushing against the shaft, while that of the other rod is the other surface of the bushing. These bearings have babbitt linings in reinforced phosphor bronze shells. Thus there are four connecting-rod bearings on the crankshaft just as a four-cylinder motor would have. The length of the crankshaft to the outer ends of the end bearings is 26 1-2 inches.

Directly above the crankshaft is the single camshaft with eight cams, one operating two opposite inlet valves or two exhausts as the case may be. The cam assembly is on the underside of a plate which bolts to the top of the crankcase between the two blocks of cylinders. Pivoted to this plate also are the small arms which are interposed between the ends of the push rods and the cams so that the lift will be straight upward instead of having a side thrust component. The camshaft has five bearings.

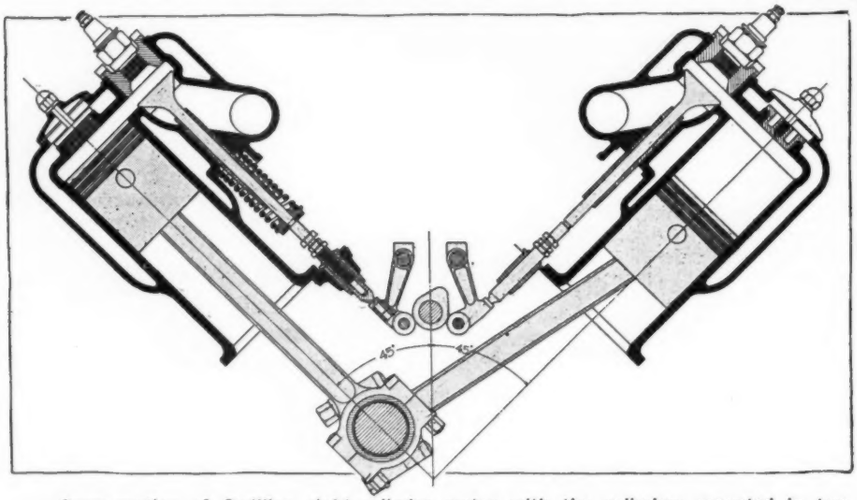


CRANKSHAFT ON EIGHT-CYLINDER CADILLAC

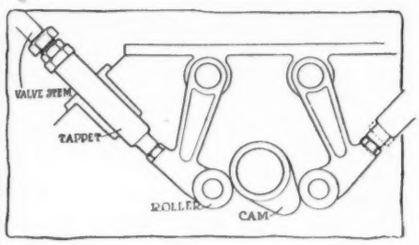
A three-bearing crankshaft is used with the throws at 180 degrees, as in a four-cylinder design. Two connecting rods attach to each crankpin, this being possible by having one connecting rod with a split or forked lower end, and the other a single end to fit between the forks. This shaft is no longer than that used on a four-cylinder motor with the same cylinder dimensions. The connecting rods and pistons are in pairs, two connecting rods attaching to each crankshaft throw. One connecting rod is forked at the lower end and the other one fits between the forks. One bushing is used for both rods, this bushing being pinned to the forks of the outer rod and floating in the inner rod, which merely oscillates on it. The rods are exceptionally light



Single camshaft used in eight-cylinder Cadillac motor. On it are eight cams which operate the sixteen valves in the motor. Each cam works two valves through the rollers shown on opposite sides of it. The shaft is carried on five bearings



Cross-section of Cadillac eight-cylinder motor with the cylinders mounted in two groups of four cylinders each at an angle of 90 degrees. The single camshaft is located directly above the crankshaft, and the means whereby one cam operates the two intake valves for the opposite cylinders is shown. Note the tulip-shaped intake valves, this design of head giving a free flow of inrushing gases

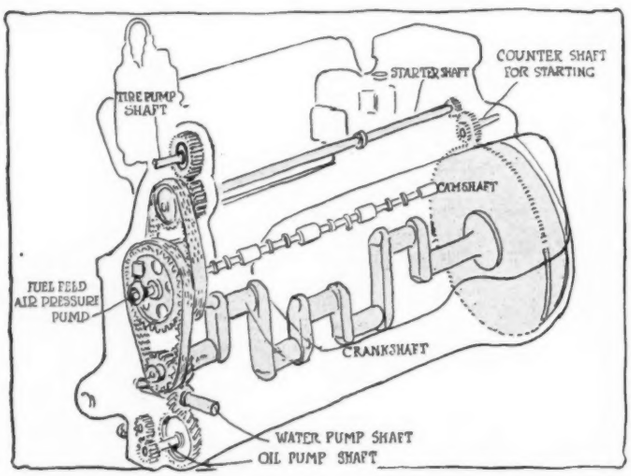


The valve operating mechanism of the Cadillac motor, showing how one cam operates two opposite valves. The cam bears against the rollers in the ends of the small arms, which are pivoted to the plate above and which are interposed between the ends of the push rods and the cams, so that the lift will be straight upward instead of having a side thrust component. Adjustment of the valves is obtained in the usual way by lengthening the tappet. The upper part of the tappet screws into the lower and the two are locked by a nut. The position of the cylinders makes the valves extremely accessible

Vertically in line above the camshaft and crankshaft is the generator shaft which drives the fan and the combined motor-generator mounted on top of the camshaft plate and between the cylinder blocks, and also carries a gear which may be meshed with that of the tire pump carried at the forward end of the motor.

Both camshaft and generator shaft are driven by silent chains completely housed at the front end. The camshaft carries two sprockets, the outer carrying the chain running down to the crankshaft sprocket and the inner driving the chain which passes around the generator shaft sprocket above.

At the front of the engine and below the crankshaft is a transverse shaft driven from the crankshaft by spiral gears. A centrifugal water pump is located on either end of this shaft, one taking care of each block of cylinders.



Shafting system in the Cadillac eight-cylinder motor, showing the use of two silent chains, one driving the camshaft and another driving from the camshaft to the shaft driving the Delco system. The tire pump is driven by spur gear. There are two water pumps on the cross shaft below the crankshaft, and from this shaft in turn drives the gear oil pump indicated

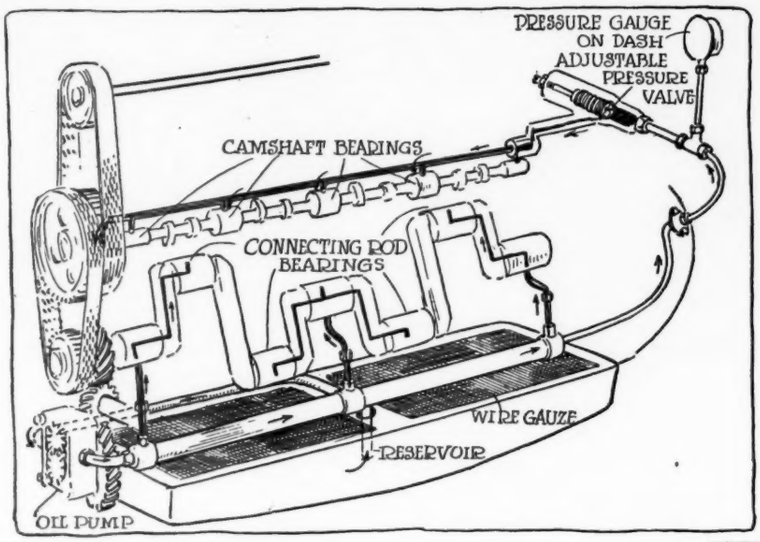
Light Weight Parts

In order to secure the accurate balance necessary to a high speed motor of this type so that it will be practically free from vibration, the pistons and connecting-rods are machined to very close limits. Uniformity of weight is important. Remarkable lightness of these parts has been attained due to the use of a special alloy steel for the rods which has great strength with extreme lightness, and also to the special form of the cast iron pistons, each of which has three ring grooves with three thin steel rings per groove. The wrist pins are fixed in the connecting-rods and oscillate in the pistons. They are constructed of chrome nickel steel tubing, case hardened and 5-8 inch in diameter.

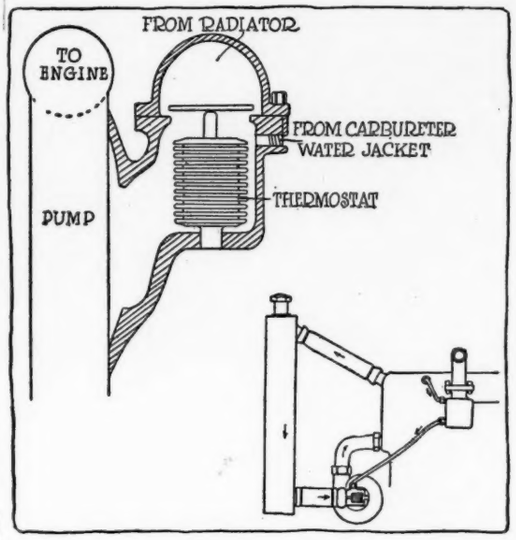
As another indication of the refinement to which this motor has been subjected, the inlet valves are of tulip shape so as to facilitate the intake of the gas, while the exhausts are of the flat type and of tungsten steel.

Order of Firing

In firing, the order alternates from one side to the other, so that there is a power impulse first from a cylinder on one



Lubrication of the eight-cylinder Cadillac motor. The pump draws the oil up from the reservoir and forces it through the pipe running along the inside of the crankcase. Leads run from this pipe to the crankshaft main bearings and thence through drilled holes in the shaft and webs to the rod bearings. It also is forced from the reservoir pipe up to the pressure valve, which maintains a uniform pressure above certain speeds, and then overflows from this valve to a pipe extending parallel with and above the camshaft. Leads from this latter pipe carry the oil by gravity to the camshaft bearings and chains. Pistons, cylinders, etc., are lubricated by the overflow thrown from the rods



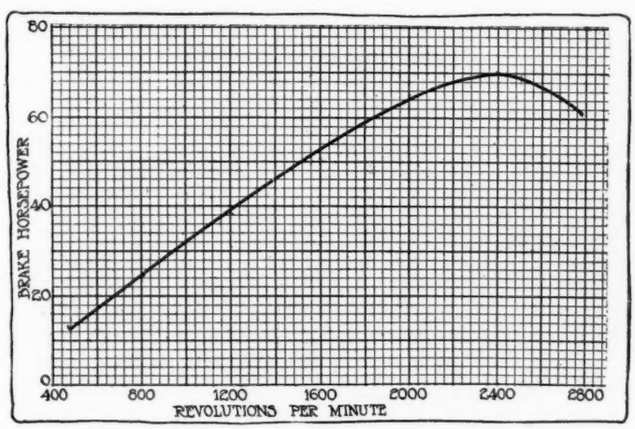
The temperature of the cooling water in the new Cadillac motor is controlled by a thermostatic arrangement, the principle of which is shown in the sectional sketch. When the water is below the desired temperature the thermostat is contracted and allows the valve to seat, so that only that part of the water going through the carbureter jacket and the water jackets of the cylinders is circulating by means of a by-pass

side followed by an impulse from a cylinder on the opposite side. The order of firing is indicated below:

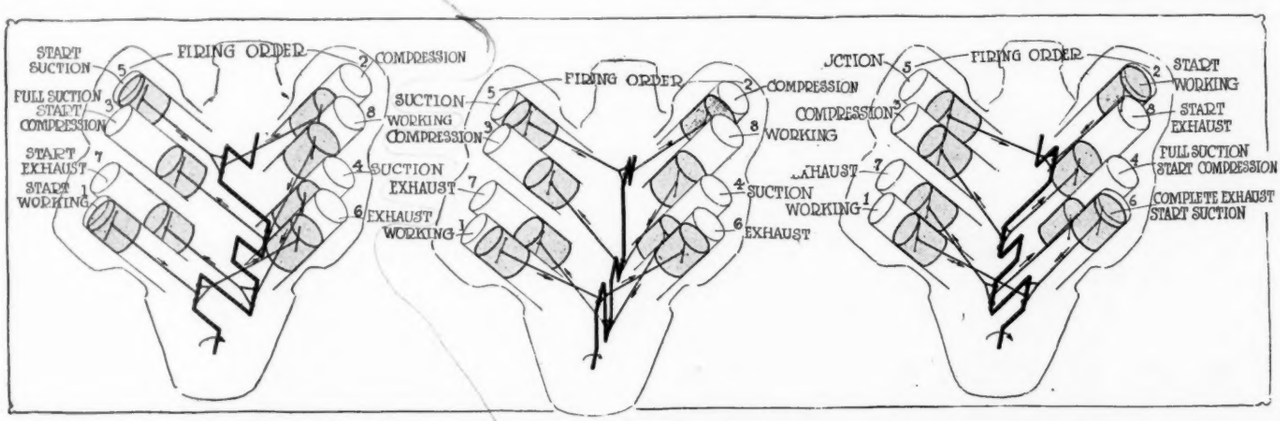
Front
6X — X1
4X — X7
8X — X3
2X — X5
Rear

That is, No. 1 cylinder on the right fires first, then No. 4 on the left, No. 3 right, No. 2 left, and so on. As to the timing, the inlet valves open at top dead center and close 45 degrees after bottom dead center, while the exhausts open 45 degrees before bottom dead center and close at top dead center.

The Cadillac single-jet carbureter, specially adapted to this type of motor, is used. It occupies a position midway of the engine and between the cylinder blocks. A form of U mani-



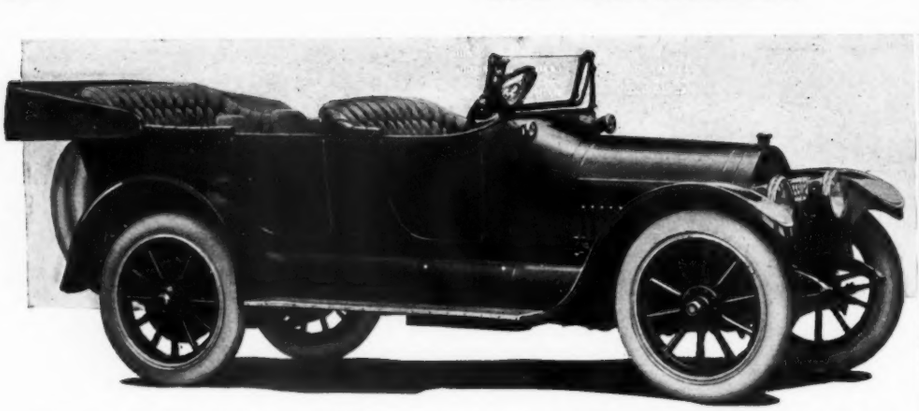
Horsepower curve of Cadillac eight-cylinder motor

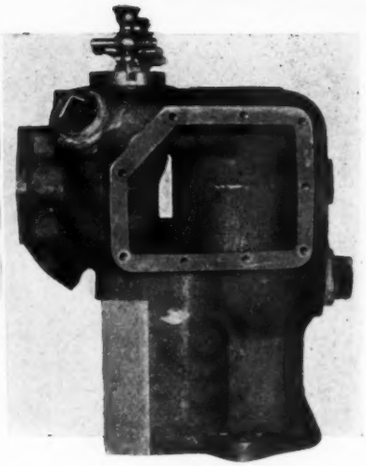


Showing the relative positions of the pistons and what is taking place in each cylinder when No. 1 cylinder commences its working stroke. All pistons on the left are either all the way up or all the way down, while all four on the right are midway

The order of events in the cylinders when the plane of the throws is vertical. The various parts of the cycle are well under way in the cylinders. The function that each cylinder is performing is indicated in the lettering

The shaft has now revolved through 90 degrees and the piston positions of the two sets are just the reverse of what they were in the first diagram. Those on the left are midway of their travel. The fourth cylinder in the right block is just firing

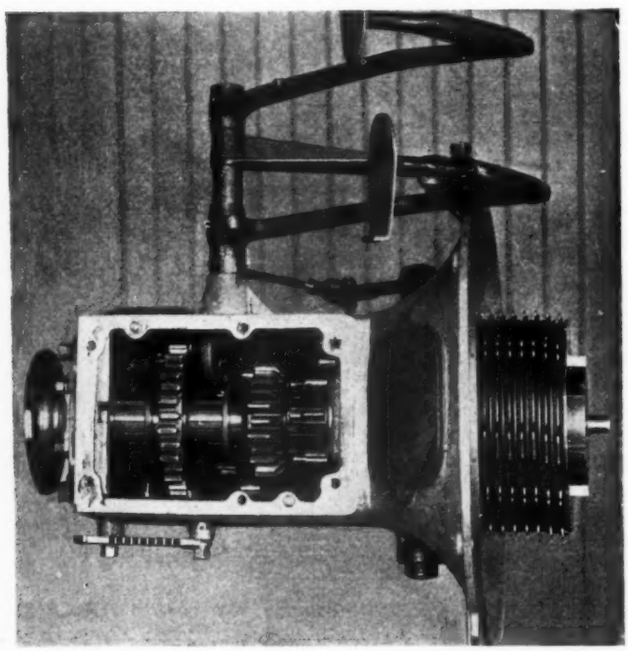




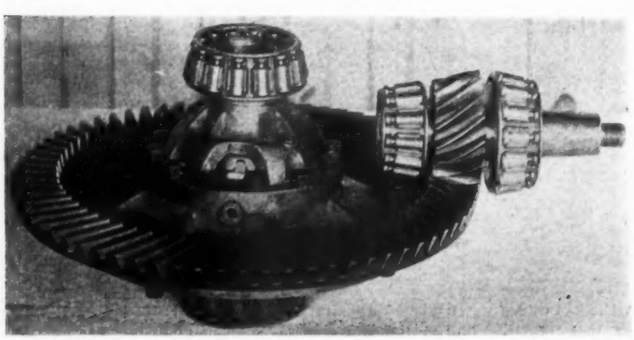
The 1915 Cadillac with eight-cylinder motor. Wheelbase 122 inches. At the right is one of the cylinder castings showing the open water space from end to end

fold runs from it to the two cylinder blocks, the distribution to the various cylinders being done within the casting.

An entirely new feature to automobiles is the application of thermostatic control to the temperature of the cooling water, so that, in running, this water is maintained at nearly a constant temperature. In principle this thermostatic regulation is the same as the form used in connection with the heating systems of houses.



Top view of three-speed gearset and multiple disk clutch used on new Cadillac. This gearset is a unit with the motor, a new construction with Cadillac. It is the first year in which a multiple disk clutch has been used by this company



Spiral bevel gear is used in the rear axle of the Cadillac. The axle is of Timken design and construction, excepting that these spiral bevels are manufactured in the Cadillac factory

Thermostatic Control

In the Cadillac application, there is interposed in the water pump line for each set of cylinders a thermostat which is simply a small coiled copper tube containing a liquid which expands or contracts in accordance with the temperature, thus slightly lengthening or contracting, its total movement being 1-4 inch. This thermostat is in connection with a valve so that when it expands, it raises the valve from its seat, this valve controlling the flow of water to the radiator from the pump. A by-pass connects with the water jacket of the carbureter, and when the engine is started, the water is naturally cold. Therefore the thermostat is contracted and its valve on its seat. Thus the radiator water is shut off, the circulation being simply through the water jackets of the cylinders, through the by-pass tc the carbureter iacket and thence back to the cylinders.

There is thus only a small part of the water circulating, and when this heats up, the thermostat begins to expand and lift its valve from its seat, letting the radiator supply flow into the system. This action continues back and forth so that the water temperature is nearly constant.

Motor Lubrication

As regards motor lubrication, the engine incorporates a positive system of force-feed type. A gear pump located at the forward end of the motor and driven from the crankshaft takes the oil up from the oil pan in the lower part of the crankcase and forces it through a reservoir pipe running along the inside of the crankcase, from which pipe there are leads to each of the main bearings. The crankshaft and webs are drilled and oil is forced from these main bearings to the connecting-rod bearings through the drilled holes. The forward and rear bearings supply the rod bearings nearest them, while the center bearing takes care of the rod bearings on either side of it. The oil is then forced from the main reservoir pipe up to the relief valve which maintains a uniform pressure above certain speeds and overflows from this valve to a pipe extending parallel with the camshaft and above it. Leads from this latter pipe carry lubricant by gravity to the camshaft bearings and front end chains. Pistons, cylinders and piston pins get their oiling by the oil thrown from the lower ends of the connecting-rods.

As heretofore, the Cadillac uses the Delco combination electrical unit for cranking, lighting and ignition, the special eight-cylinder distributer being in unit with the motor generator. As has already been pointed out, the unit is driven as a generator from the camshaft by a silent chain, its shaft

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The Automobile as Valuable as Railroad in War

Automobiles of Immense Service in France—Both for Army and Transporting Refugees—Private Motoring at Standstill—Cars Cannot Leave Paris

By W. F. Bradley

PARIS, Sept. 10—Automobiles were never so closely watched and never so highly appreciated as at this present moment. With railroad communication cut, with crowds fleeing in terror, with fierce fighting on every hand, the possession of a car is considered a valuable asset. The few old-school army officers who swore by horses and plenty of men have finally had to admit that their methods are out of date.

The automobile is as valuable, if not more valuable, at this present moment, than the railroad.

Because they recognize their value for good or for evil, the authorities in France have imposed hard restrictions on the use of cars.

No man can use a car unless he has a special permit from the military authorities; that permit must be shown every few miles. None but military cars can be on the road after dusk.

Paris Closed at Noon

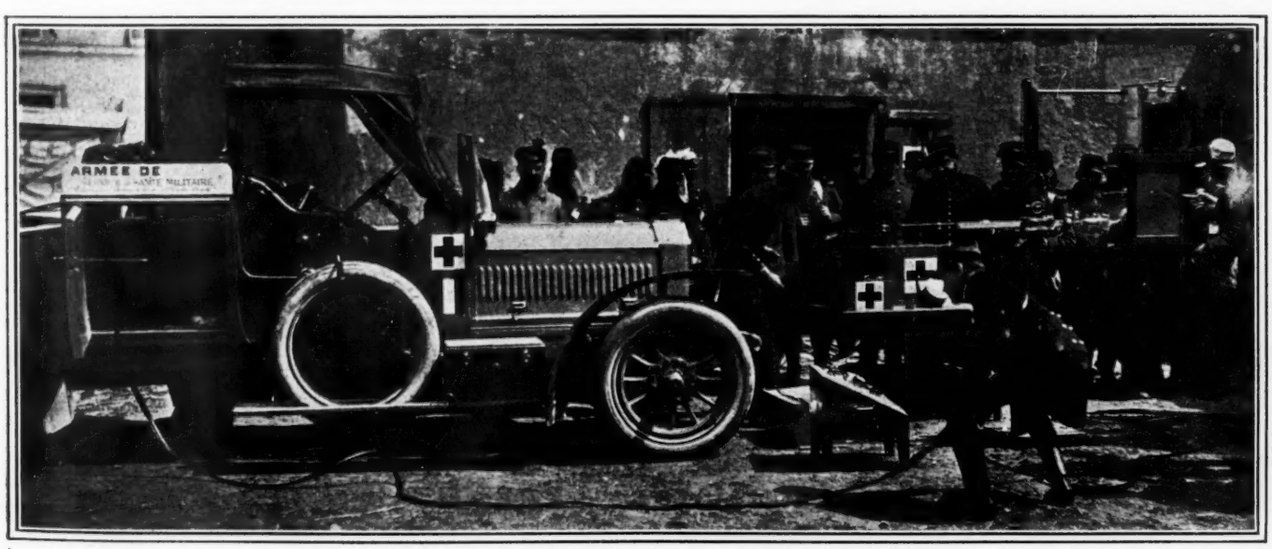
Yesterday the government issued orders that no more cars should be allowed to leave Paris after 12 noon. As it was known that the government was preparing to transfer to Bordeaux, and that the German troops were making desperate efforts to invest Paris, there was a wild stampede for the western provinces. Paris is surrounded by fortifications and gates. All those gates had to close at noon. Cars were loaded up with baggage, passengers were piled in with no other seat but the top of the trunks. At the Porte Maillot, one of the most important gates of Paris, the scene almost baffled description. In an unbroken stream cars poured through. They were of every type from the single-cylinder runabout to the loud-voiced, semi-racer and the handsome limousine. They were similar in one respect: they were packed with baggage and passengers to more than three times their ordinary load. As it was practically certain that no gasoline could be found on the road, enough had to be carried for a journey of 200 to 400 miles. All the oil, tires, spares, etc., that could possibly be required had to be taken aboard.

Exodus from the Capital

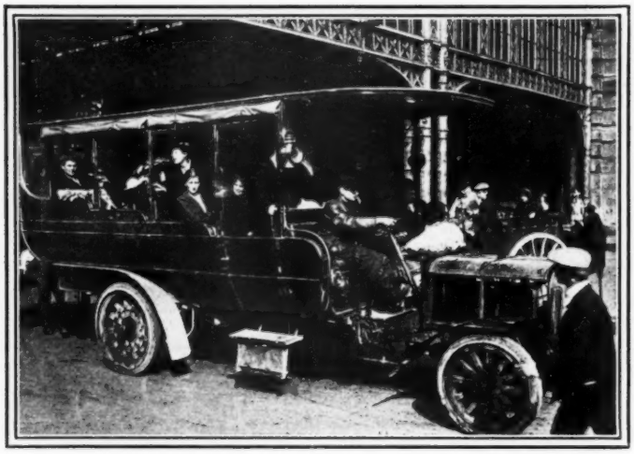
As much furniture as could be saved was packed into the car; trunks were strapped on the running boards until the sides of the car disappeared. In one case, when the car had been loaded in this way, the ladies could not climb back into their seats. A tall cavalry officer who was passing lifted them in. Rich families possessing more than one car put their women folk in one and their valuables in the other. A family of seven had crowded themselves into a car made for four, and by some superhuman feat had got trunks and bedding in with them. The driver's hat blew away as he neared the gates, but so great was his fear that he might be shut in that he did not stop.

An American family was being taken on a small car to the Packard garage just outside the city, where they were to be transferred to a big car carrying them to the coast. When they got through the gates the terror of the head of the family was so great that he threatened and persuaded the chauffeur to continue with the little car, rather than lose the time necessary for the transfer.

On the main roads just outside the city the automobilists overtook processions of peasants in lumbering farm wagons



Medical corps with French Army. The big De Dion carries an X-Ray outfit



Refugees from Belgium and Northern France leaving Paris

who had been turned out of the farms within range of the forts forming a belt round the city. Wizened old grandmothers and wrinkled old grandfathers shared the wagons with healthy children, ricketty furniture, bedding, perambulators, fowls and domestic animals. Heavy wagons loaded with cartridges made in the automobile factories transformed for this purpose traveled along; an automobile towing an armored aeroplane claimed a right of way and was given it.

Many of the drivers of the cars were merely desirous of placing their women folk and children in a place of safety. When this had been done the men would return to Paris to take up military duties. This meant that they had to travel 400 miles or more without a stop, for failure to be back on time would cause them to be marked down as deserters.

One of the engineers of the Pipe Automobile Co., Brussels, has given me interesting particulars of how automobiles were made use of in opposing the advance of the Germans into Belgium. Belgium had no armored automobiles, but the Pipe company undertook to place some at the disposal of the army at very short notice. A number of 80 horsepower chassis were prepared, and in conjunction with a manufacturer of fireproof safes who had his works next door, chrome nickle steel plates were put round the platform body on which a quick-firing gun had been mounted. The wheels and the gasoline tank were protected in the same way, while the driver was protected by an inclined plate coming practically level with his eyes. All the plates were fastened at the base only, thus giving a certain amount of flexibility which tended to deflect the bullets.

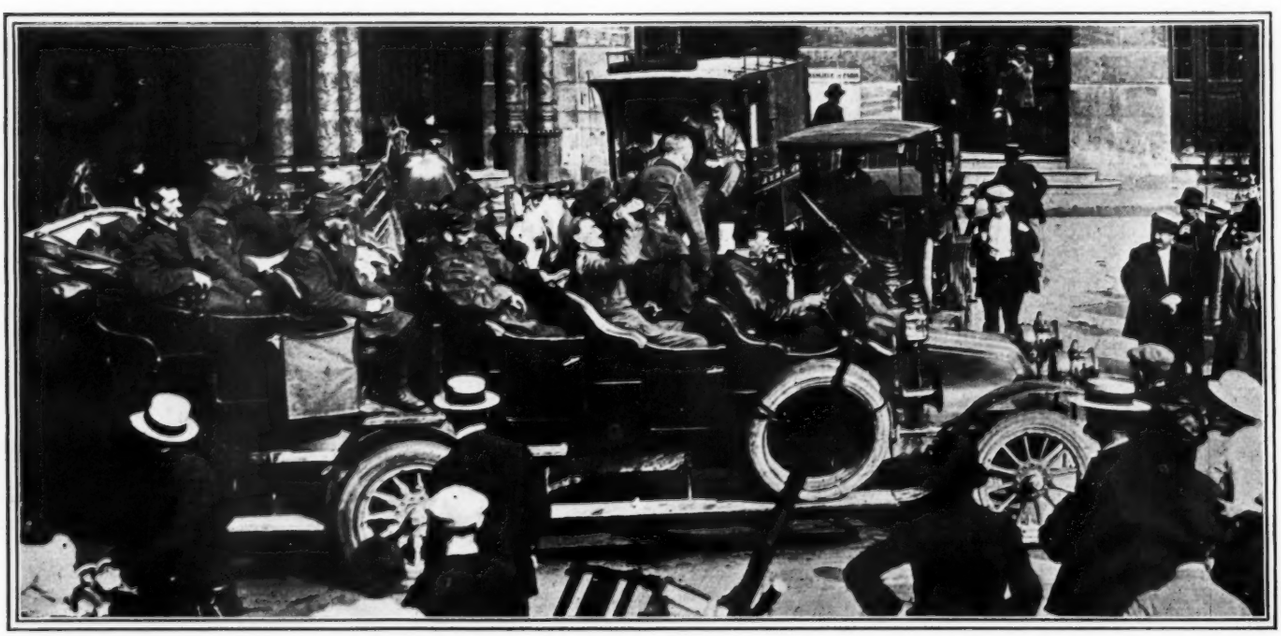
Although hastily constructed and lacking in finish, these vehicles proved invaluable to the Belgian troops. The armor plating was pitted with bullets, but not a single shot went through. When the Germans entered Brussels it was seen to what an extent they had made use of armored automobiles in all their operations. Their plan was to advance with these vehicles into districts only poorly guarded, bombard the villages, set fire to a few houses and continue leaving the peasants in a terrified condition.

Brussels had no well organized automobile service to fall back upon when her territory was invaded. The authorities therefore sent police into the streets with orders to seize all suitable cars. The passengers were turned out and the driver, if of Belgian nationality, was put under military orders. This plan worked well, for each man knew his car and could get the best possible service out of it. In other towns, where cars were requisitioned and given to military drivers much trouble followed, for it frequently happened that the drivers had no experience with this make of car and quickly had their vehicles in a broken down condition.

B. N. D. Steel Factory Wrecked

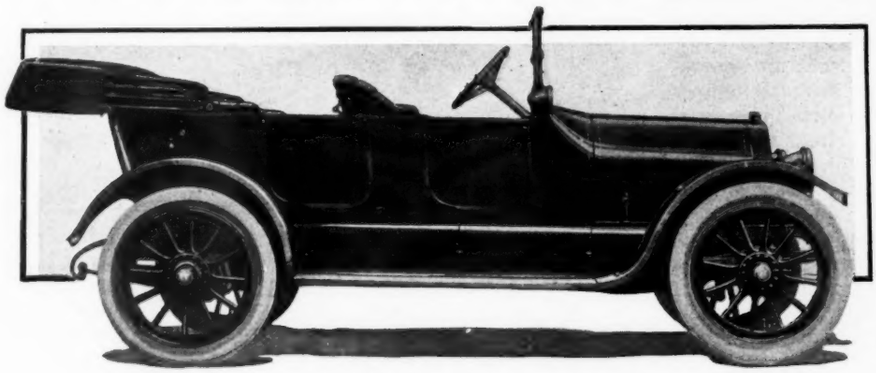
The Pipe factory, one of the most important in Belgium, has escaped damage, for it is located in the heart of the city. It is practically certain that the Derihon factory, at Liege, where the famous B. N. D. steel is produced, has been completely wrecked. This factory was situated at the foot of one of the forts on the outskirts of the city, and it was at this point that fighting was most severe. No definite news has been received as to the whereabouts of the Derihon Bros. one of whom was in active service with the Belgian troops.

It is also believed that the F. N. factory at Liege has been razed to the ground. This factory, in addition to producing automobiles and motorcycles, was the small arms works of the Belgian government. The women who work in the gun-making departments took up arms when the men had been called away, and as these women are all excellent shots they were able to do some destructive work.



French and English wounded soldiers leaving the Gare du Nord, Paris

Overland 81, Fully Equipped, $850



Overland 81 five-passenger touring car with left drive and center control

Four Cylinder
4 by 4.5 Motor—Electric Starting and Lighting—
—Left Drive—Center Control—
Also Roadster and Delivery Bodies

MODEL 81 is a new Overland for next year, which sells at $850 with full equipment, including electric lighting and starting units. The same chassis with a roadster body, with the same equipment, sells at $795.

This chassis when fitted with an open express delivery car sells at $850 and with a panel delivery body at $895. These prices of delivery wagons include the electric lighting and starting equipment.

This new Model 81 is a typical Overland design in that the standard features of the Willys-Overland Co., Toledo, O., have been strictly adhered to. Except for a slight difference in bore, the engine is practically the same as that of the larger 1915 model, which made its appearance in August. The bore of model 81 is 1-8 inch less than that of the larger model. The cylinders measure 4 inches diameter and the stroke is 4 1-2 inches. The cylinders are separate castings and the same general arrangement of parts such as manifolds, accessories, valves, etc., is adhered to. Back of the motor is the standard Overland construction with the gearset forming a unit with the rear axle.

This new Overland car, selling at so low a price as $850, is the result of large-quantity production facility at the factory, which facilities have each year been added to until today the plant embraces a great area with a large array of departments in which practically every part of the car, including frames and radiator, are manufactured.

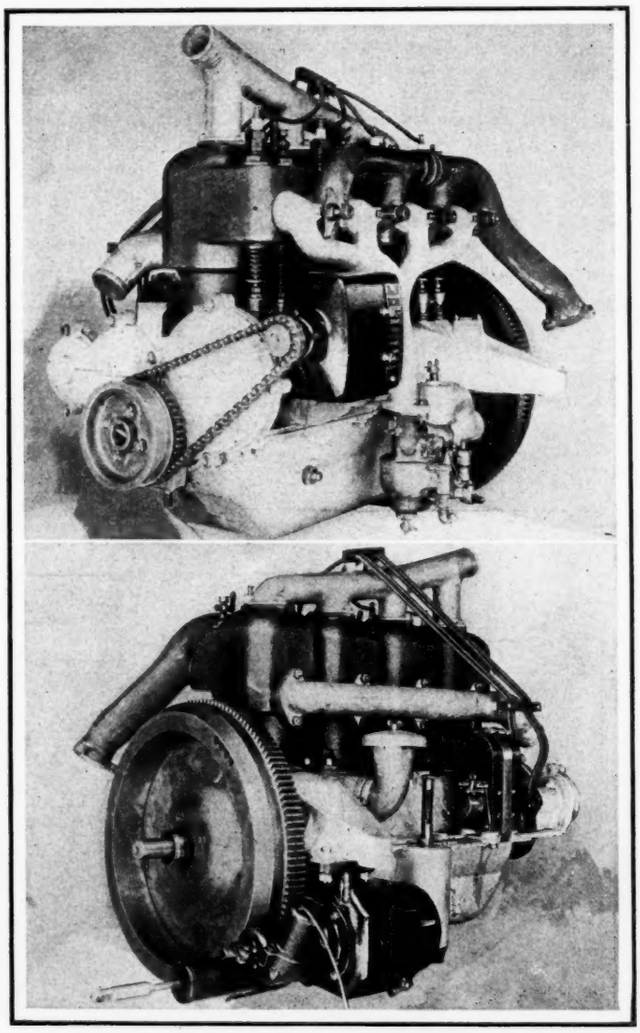
Develops 30 Horsepower

The motor in model 81, 4 by 4 1-2 inches, gives a formula rating of 25.6 horsepower, but actually develops 30 horsepower. It has a piston displacement of 227.5 cubic inches, and its stroke-bore ratio is 1.125. Like other Overland motors, thermo-syphon cooling is employed in conjunction with a cellular-type radiator affording vertical circulation. This radiator has a shell pressed from one piece of sheet steel in the company's radiator plant. With this construction the round edge appearance of the radiator is possible.

The left side of the motor is given over to the valves, the manifolds, carbureter and generator. Both intake and exhaust headers must naturally have separate openings to each of the cylinders, the exhaust pipe passing above the intake. The carbureter has a hot-air attachment. The exhaust manifold is made in two sections so that that portion serving the front two cylinders may be removed without taking off the entire manifold, or vice versa.

Valve Parts Accessible

Valves are not enclosed and present conventional appearance. A yoke construction with a bolt drawing down at its center holds down the tappet assemblies for each cylinder—



Upper—Overland model 81 motor showing mounting of the generator which is driven by a silent chain from the crankshaft. The carbureter is carried low and the motor is suspended at three points. Bottom—Right side of motor showing starter and magneto positions. Note the simple method of carrying the high-tension wires

The water pipes are without sharp bends that might pocket the water, and are of larger diameter. On this side also is a large breather and an oil level indicator

intake and exhaust. This one bolt allows their removal in simple fashion. The valve mechanism of the Overland leaves nothing to be desired in the way of accessibility.

Lubrication by Splash

Lubrication is maintained by a constant level splash system with individual splash troughs under each cylinder. Into these the rod ends dip and throw the lubricant up into the cylinders and onto the bearings. The level in the troughs is maintained by a geared oil pump, and a revolving sight-feed indicator on the dash tells that the oil is circulating. The lower part of the crankcase below the troughs forms the oil reservoir into which the overflow falls ready for re-circulation after straining.

Ignition, entirely independent of the lighting and starting equipment, is provided for by a high-tension magneto located on the right forward side of the engine and driven by a shaft in connection with the timing gears.

Separate Electrical Units

As to the other electrical functions, the generation of current and the cranking are taken care of by separate units. The generator, mounted on the left front of the crankcase on a bracket attached thereto, is driven by a silent chain from a sprocket on the front end of the crankshaft and just back of the fan belt pulley. Due to the difference in size of the sprockets, the generator operates at 2.6 times crankshaft speed. It begins to charge the battery at 8 miles per hour and at 25 miles an hour is producing its full charge of 14 amperes. Due to the reversed series coil, the output does not go above this amount regardless of car speed.

The starting motor is compactly built series-wound machine operating on the battery current of 6 volts. It is located at the rear of the motor on the right, and acts directly on the flywheel, a sliding pinion on the electric motor shaft engaging with teeth cut on the rim of the flywheel when the gear latch is released and the heel button pressed down. The ratio of the electric motor speed to that of the engine is 11.1 to 1.

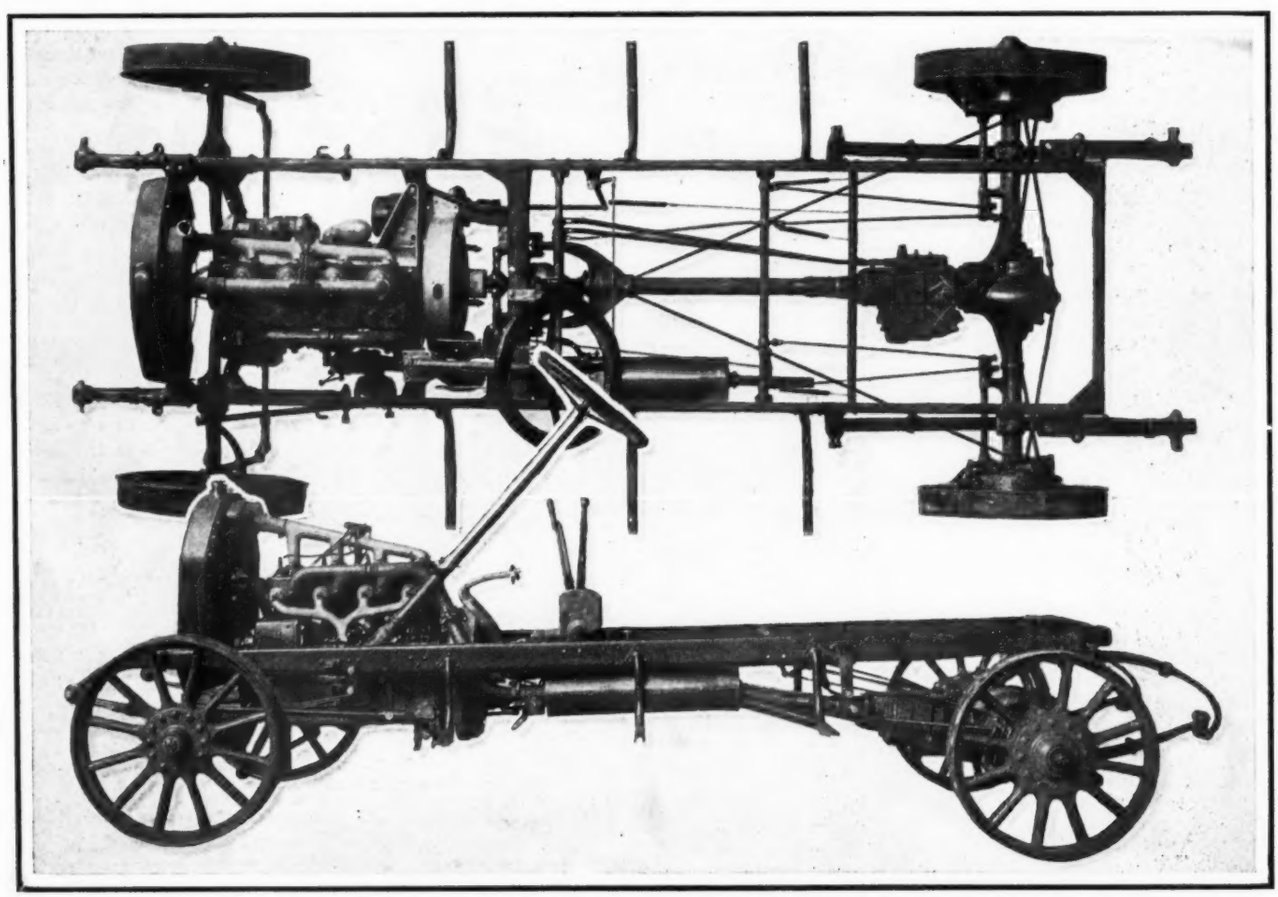
Three-Point Suspension

The motor is suspended on three points. At the rear of the crankcase and just ahead of the flywheel there is an integrally cast arm extending out to and resting upon a diagonal frame member which in turn fastens at one end to the frame side member and at the other to the main cross member back of the motor. Thus the arms do not have to be long enough to extend out to the side rails and are thus stronger. The third supporting point for the motor is at the center of the front where it rests upon a frame cross member which is bowed downward.

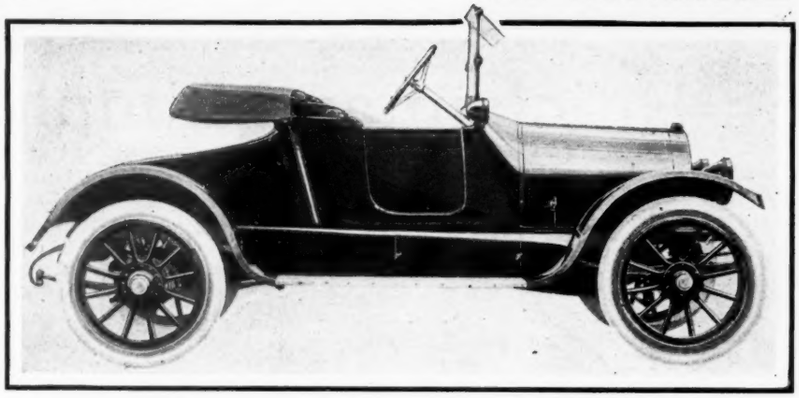
Five-Bearing Crankshaft

The crankshaft, which is carried on five main bearings in the upper half of the crankcase, is due to this number of bearings and its size, very rigid and free from vibration, a feature which the motorist today is coming to think a great deal of, for it tends to greater silence, power, flexibility and less wear. Pistons, each of which is fitted with three piston rings are secured to the connecting rods by conventional wrist-pins carried in the piston bosses.

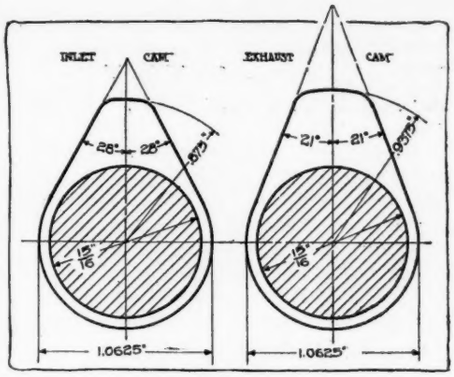
The camshaft is mounted on three bearings and like the crankshaft is drop-forged from carbon steel. The valves are made with carbon steel stems electrically welded to 3 1-2 per cent. nickel steel heads. They are of usual form and seat at 45 degrees.



Upper—Birdseye view of chassis showing straight frame members. The torque tube and axle ends are strengthened by struts. Lower—Elevation of chassis



New Overland model 81 runabout which sells for $795



Intake and exhaust cams

The principal motor dimensions follow:

Crankshaft bearings:

Front—1 1-2 by 2 1-8 inches.

Three center—1 1-2 by 2 1-8 inches.

Rear—1 1-2 by 4 inches.

Connecting-rod lower bearings: 1 1-2 by 2 1-8 inches.

Camshaft overall length—27 9-32 inches.

Camshaft bearings:

Front—15-16 by 2 1-4 inches.

Center—15-16 by 3 1-8 inches.

Rear—15-16 by 2 9-16 inches.

Valve lift—13-32 inch.

Valve diameter—1 13-16 inch.

Valve seat—1-8 inch by 45 degrees.

The cone clutch used is leather faced and acts in the flywheel in the usual way, four springs holding it in engagement. Inserted in the cone face are spring-pressed studs to augment easy action, while a clutch brake stops it from spinning when thrown out. This aids gearshifting. Back of the clutch there is a universal joint, which is on the forward end of the propeller shaft just ahead of the point where it enters the torsion tube. A substantial yoke hinging at its ends to the center frame cross member carries the front end of the tube. Diagonal radius rods run from this point to the ends of the rear axle. Thus the drive and torque are well taken care of.

Gearbox on Axle

Through flanges, the gear box bolts to the torsion tube and the axle housing. It is compactly designed and affords the usual selectively obtained three forward speeds and reverse. The gears are of nickel steel and the shafts are carried on annular ball bearings. The control levers are mounted at the center of the control shaft which is mounted just back of the center cross-member. Rods run from this control back to the gearbox and to the brakes.

The rear axle is the Overland floating type design with four differential gears; the axle shafts removable and roller bearings carry the loads with ball thrust to take the end thrust. The brakes are of ample size, the drums being 10 inches in diameter and 2 1-4 inches wide.

Springs are long and flat, which is a feature for easy riding. The rear springs are slung under the axle with swivel seats while the fronts are of the regular half-elliptic type. The dimensions are 36 and 46 inches, front and rear lengths, respectively, while all leaves are 1 3-4 inch wide.

Frame Straight

The frame makes a good manufacturing proposition, in that there is no kick up at the rear, nor is there any insweep at the front. The wheelbase is 106 inches and tread 56 inches. The car carries 33 by 4-inch quick detachable tires on demountable rims and the wheels are of wood, artillery construction. Steering is on the left.

The body is a smooth line design with steel panels and doors, and wood frame. The cowl slopes to the bonnet and the instrument board has the various gauges and speedometer conveniently grouped and lighted by a dash lamp. The doors are of the front-hinged U form and their hinges are concealed. The fenders conform closely to the curve of the wheels and running boards are clear.

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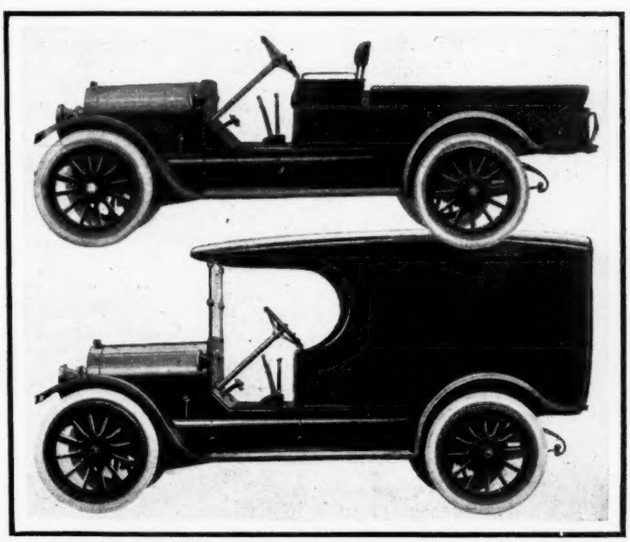
Gain of $106,000 in Massachusetts Fees

BOSTON, MASS., Sept. 14—Up to September 1 Massachusetts motorists have paid into the State coffers $870,182.19 in fees and registration licenses, which is more than $106,000 in excess of the amount paid for the entire 12 months of 1913. If the present rate of registering continues the total for 1914 will be close to $1,000,000. There had been registered up to September 1 73,367 motor vehicles, which shows an increase of 23 per cent., or 13,789, over the same period in 1913, and 6,747 more vehicles than were registered during all of 1913. There are nearly 88,000 people authorized to operate motor vehicles in the Bay State now. The figures for the first eight months of 1913 and 1914 follow:

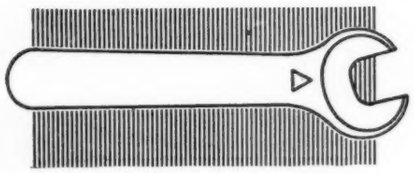
Automobiles	59,569	73,367
Motorcycles	6,578	7,553
Manufacturers and dealers	1,300	1,491
Operators	14,039	16,834
Chauffeurs	4,195	4,044
Operator renewals	34,762	43,111
Chauffeur renewals	13,542	16,165
Receipts	$719,331.09	$870,182.19



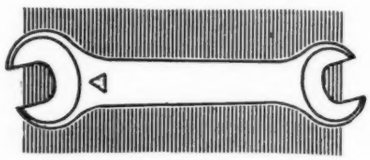
Upper—Overland 81 with open delivery body. It sells for $850
Lower—Overland 81 with closed delivery body. This sells for $895

Forged Wrench Efficient and Simple

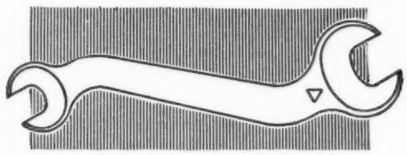
By F. C. BILLINGS
Vice-President of the Billings and Spencer Co.



Engineers' single head



Double head engineers' type



The popular S-wrench

PROBABLY the most abused, least considered and yet the most indispensable tool in the kit of the mechanic, farmer, automobilist, aviator, et cetera, ad infinitum is the wrench, the solid open-ended wrench, known to the British mechanician as the fixed spanner and known in the United States as the machinists' wrench.

Of the many kinds of wrenches, the cheapest, strongest, most efficient and most durable is the open-end wrench. This style of wrench varies in quality and price in the following order: gray iron castings, malleable iron castings, sheet steel stampings and steel drop forgings.

The drop forged wrench is superior to all in quality, strength, durability and utility. It should be made from selected .15 to .25 carbon open hearth bar steel. The bar steel is heated and the wrench formed in dies held in heavy forging hammers. After forging, the wrench passes through various operations of trimming, grinding, milling the openings to size, and not the least important is the heat treatment.

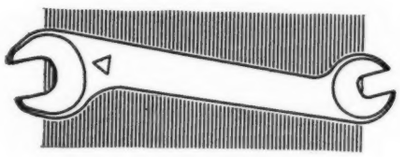
Three Grades of Wrenches

Drop forged wrenches are manufactured and listed in three grades of finish known to the trade as milled or unfinished, semi-finished and full-finished.

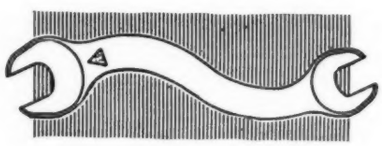
The unfinished wrench is the rough forging with openings milled to size. The semi-finished wrench is the same with the addition of heat treatment and hardening, and with the heads brightened. The full-finished wrench is polished all over before the heat treating and the hardening operations and, with brightened heads, is finally treated with a lacquer finish which acts as a rust preventive and gives the wrench an attractive appearance.

Engineers' Wrenches

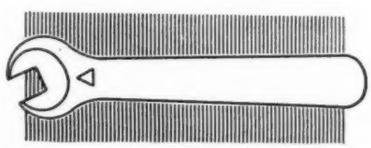
Open-end wrenches are made in a variety of styles and sizes. The style most used is the 15-degree-angle-single-and-double-end-line, also known as the engineers' line. This line was designed primarily to fit U. S. standard bolts and nuts and is also furnished with openings to fit square and hexagon head cap screws, A. L. A. M. standards, S. A. E. standards, and, for export to the British possessions, Whitworth standards, and for Europe the International standard.



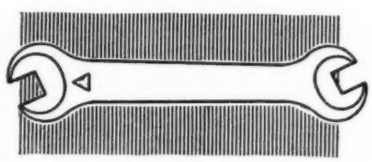
Textile wrench for mill work



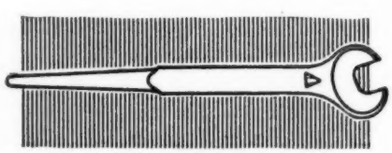
General service wrench



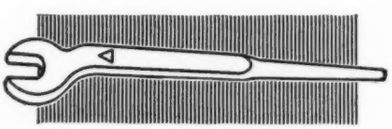
Single head set screw wrench



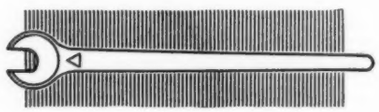
Double head set screw type



For construction work



Structural type of wrench



Single head track wrench

The term 15-degree-angle refers to the angle at which the head of the wrench is placed on the handle and has been determined to be the angle at which the utmost efficiency can be secured in confined places.

Further points considered in designing this line are the size and thickness of heads to give the required strength without unnecessary weight and the shapes and length of handles to give the necessary leverage.

Two styles of handles are used on this line of single-head wrenches: the flared handle, which is narrowest where it joins the head and widest at the end, and the taper handle which is widest where it joins the head and narrowest at the end.

The flared handle is used on wrenches up to about 14 inches in length and the taper handle on the larger sizes.

Check Nut Wrenches

Check nuts are used to prevent threaded connections from working loose on account of vibration. These check nuts are quite thin as compared with other styles of nuts; also two check nuts are often used together to further insure the fixedness of the threaded connection; therefore check nut wrenches have quite thin heads. Otherwise they are of the same general style as the engineers' or 15-degree-angle wrenches. They are made in both single and double end.

S Wrenches

S wrenches are very popular and are made with all the different standard openings. Owing to its shape, from which it derives its name, this style of wrench is used in confined places where

a straight-handled wrench will not reach the nut or bolt.

The so-called textile wrenches were originally designed by a firm which manufactured looms and other textile machinery. This is a double head line with heads at an angle of 22½ degrees with the handle. The wrenches are considerably lighter than the engineers' line and with thinner heads. These wrenches are largely used in mill towns by loom fixers, etc. They are furnished with all of the standard openings.

General Service Wrenches

General service wrenches are what the name implies and were originally designed for carriage makers' use, and are popular with carriage makers, farmers, garage men, etc. They are light, handy wrenches, and owing to their lightness should not be used for severe work. This line is furnished with all the standard openings, including A. L. A. M. and S. A. E.

Set-Screw Wrenches

The tightening of set screws is one of the hardest uses to which a wrench is put, and the average wrench is not strong enough for this duty, therefore the reason for a line of single and double end set screw wrenches especially designed for this work.

Construction and Structural Wrenches

Construction and structural wrenches are especially designed for bridge and structural iron workers. Construction wrenches are made with 15 degree angle and structural wrenches are straight with an offset head. Both these lines have a round, pointed handle which is used to bring punched holes in beams into line so that a bolt or rivet can be inserted.

Track and Car Wrenches

Track wrenches and car wrenches are used by railroads in the construction and maintenance of tracks and cars.

Machine and Tool Post Wrenches

In addition to the above and in the general line of standard wrenches there are machine wrenches and tool post wrenches that are used on machine tools; also chuck wrenches for operating lathe chucks.

The foregoing wrenches about cover the different lines of open-end standard drop forged wrenches. Other standard lines are spanner wrenches and pin wrenches. These are used for turning collars on threaded spindles.

Socket Wrenches

A very complete line of socket wrenches is now manufactured and listed, both in the T-handle and bent handle varieties. These are made for both U. S. standard hex nuts and for square nuts, cap screws and set screws.

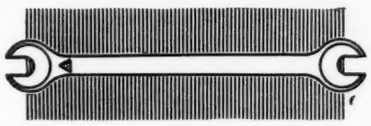
Many of the manufacturers of drop forged wrenches are now putting up wrenches in sets contained in a canvas case or bag. These sets are made up for automobilists, farmers, loom fixers and for general purposes where wrenches are used.

Wrench Display Board

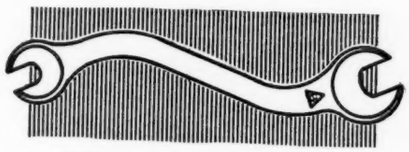
Probably one of the innovations in the matter of handling wrenches which most strongly appeals to the dealer is the arrangement of a stock of wrenches on a display board that is designed to be hung in any convenient and prominent place in the store.

In the past, when a dealer had concluded to put in a stock of drop forged wrenches and it came time to put in a stock order, as a rule he did not know what sizes, kinds or quantities to order, and was apt to ask the salesman to help him out in the matter of the initial stock order. The salesman really had no more knowledge of the dealer's requirements than the dealer himself and generally, in his desire to turn in a substantial order to the house, would stock the dealer up with what would be more or less deadwood, probably on account of locality requirements.

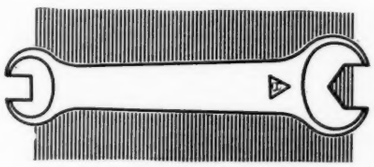
When the stock order arrived, a limited quantity of the smaller sizes would be put on the shelves and perhaps in the show cases, but the bulk would be stored in the basement in bins or on shelves, and in all probability a large part of that stock in the basement would not move in years.



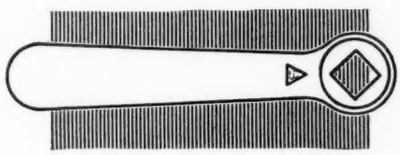
Double head track wrench



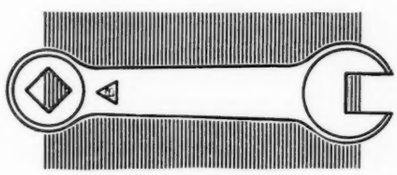
Wrench used for railroad cars



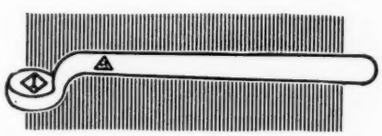
Machine wrench—double head



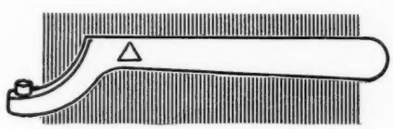
Single head tool post wrench



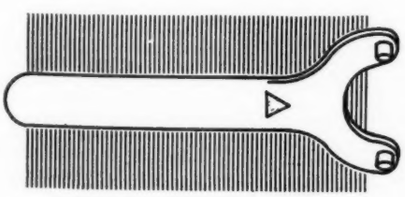
Double head tool post type



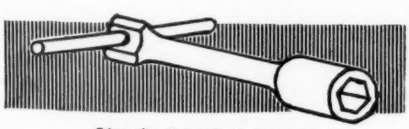
Chuck wrench for lathe work



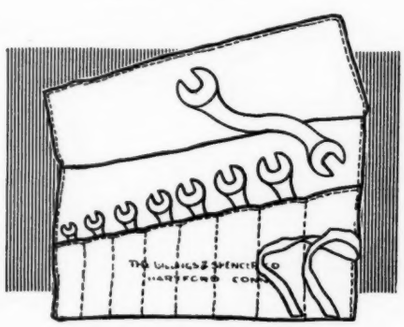
Single pin type of wrench



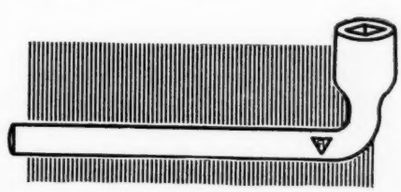
Double pin wrench



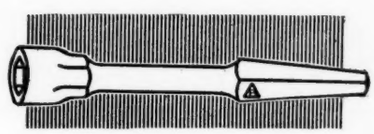
Standard socket wrench



Canvas bag and set of wrenches



Socket type with bent handle



Bit and brace socket wrench

Thinks Oversize Tires Economical for Trucks and Cars on Long Runs

The Automobile Engineers' Forum

Many Factors in Tire Wear — Trucks Most Often Overloaded and Tires Suffer from Careless Driving—Tires Age without Respect to Size

AKRON, O.—Editor THE AUTOMOBILE:—Regarding the economy and advisability of oversizing tires, there is considerable merit in both the pro and the con of the contention. While the statement that a tire would be damaged by cut or puncture, before the effects of undersizing could be appreciated, was almost an axiom as late as 2 years ago, the general improvements of highways and the general increase of engine speed in nearly every make of automobile has altered the near axiom of a new fallacy.

The touring car avoids bad roads and rough spots, considering the comfort of the passengers, if nothing else. The tire question, therefore, with pleasure cars is almost entirely one of wear and endurance. On cars of this type oversizing is unquestionably advisable, save where the car is so located that it can run only about 2 months of the year and is jacked up the other 10.

One size of tire ages just as rapidly as another and when a customer's tire trouble is chiefly due to dry and separated friction, the greater cost of an oversize tire is hardly economical.

Tire Must Keep Normal Shape

If the carcass is stronger, an oversize tire is better able to retain its normal shape under a load. The retention of this normal shape is absolutely necessary to the long life of the tire, for:—

1—Flattening out of a tire under a load offers an unnecessary amount of tread surface to the road, causing the tire to heat more and wear faster.

2—Flattening out of a tire flattens its sectional arch, destroying in great measure its ability to sustain its burden and causes the fabric to mesh or tear and blow out.

3—The flattening out of a tire requires more power to operate the car. A greater amount of gas is consumed by the engine and the gears are heated by the constant dragging.

Trucks Have Most Overloading

The greatest amount of trouble due to overloading tires is experienced by commercial vehicles. The commercial car meets with conditions radically different from those of the touring car. The principal consideration is the size of the car and its type of work.

There is first to consider the light laundry or drygoods car, on 3 and 3½-inch tires, which is required to make innumerable stops and get under way again as rapidly as possible. Such cars are in constant danger of puncturing, bruising, or tearing their tires. Their brakes are often set suddenly and skid the tire. Their engines are of a high speed type that step up from full stop to 4 or 5 miles an hour in about 30 feet. This causes a jackshaft that jerks and strains a tire or else spins it.

Oversizing on such a type of car is hardly economy. The greater tread surface offered to the road by an undersized tire gives a greater tractive power and saves the engine the jerking strain occasioned by spinning, even though it does ruin the case. There is not much danger from heating, due to the frequent stops and the fact that most of these routes are along the shaded streets of residence districts. But there is a constant danger of curb bruising, cutting in car tracks, rim cutting and punctures, and this can hardly be avoided by oversizing.

The heavier type of car, namely those on 4½ and 5-inch tires, are generally subject to long, continuous runs and their usually top-heavy loads require as stiff a side wall and tread as possible.

This type of truck is usually high geared and exerts a terrific strain on the tires in turning corners and in twisting in and out along crowded thoroughfares.

Striking the Curb Hurts Tires

Last, but not least, owing to the fact that the majority of these cars are end-doored, they invariably bang the curb in backing up for a load and here the extra ply of fabric in an oversize tire is often worth its price a hundred times.

Oversizing, therefore, is of value on trucks or cars subject to reasonably long and continuous runs, but is hardly an economy on cars that run from door to door.—RICHARD T. WALSH, Service Department, Swinehart Tire and Rubber Co.

Where Proper Inflation Fails, Oversize Tires Should Be Used

AKRON, O.—Editor THE AUTOMOBILE—The importance of keeping a pneumatic automobile tire inflated to the proper pressure, and avoiding the evil of underinflation, is something that can never be overemphasized. If less than the proper pressure be carried the weight of the car will not be properly sustained and as a consequence, there will be more or less flattening out where the tire touches the ground. This not only subjects the casing to a destructive bending action when in motion, but renders it susceptible to injury from bruises and bumps which a fully inflated tire would safely resist.

Flattened Tire Is Strained

The same condition occurs when a car with its extras is not equipped with tires large enough to properly support the load and although it be properly inflated, the weight flattens it out where it rests on the ground just as in the case of a tire large enough but not inflated to the proper pressure. The extra strain thus imposed not only breaks down the side walls but increases susceptibility to all the various forms of trouble.

In the design of a bridge where the factor of public safety is actively important, there must be no possibility of a breakdown. The strains and their combinations are carefully cal-

culated from both theoretical and empirical data. When, in this way, it is determined that a bar ¼ inch thick would be just equal to the strain, a bar 1½ inches thick—six times the thickness actually necessary—is adopted. The extra inch and a quarter is a margin of safety which insures the structure against any unforeseen and unusual strain to which it may be subject. The lack of this margin of safety would be inimical to public welfare.

Margin of Safety Necessary

By the same token, the tire which gives good service, other things being equal, is the one which not only provides the necessary strength to resist the average strains but which also provides sufficient margin of safety also to resist the unusual extra strains which at times occur even when reasonable care is used in driving.

Proper attention to inflation will usually insure good service. For the man who exercises care in this particular but who is still unrewarded with the good service usually returned by this precaution, the solution lies in the use of the oversize tire—the largest tire that fits each rim. For every standard size of rim, there are two sizes of tire which fit. For example, a 34 by 4 rim carries a 34 by 4 tire. Should the 34 by 4 tire, after the car has been equipped with its extras, prove inadequate for the support of the load, the 35 by 4½ tire which also fits the 34 by 4 rim and is the regular oversize for the 34 by 4, is the proper size to insure satisfactory service. Also the 33 by 4 is the regular oversize for the 32 by 3½.

Oversize Takes the Same Tube

Usually, it is by experience that the motorist discovers he has equipped his car with tires that are too small. He then desires to change to the regular oversize tire for his rims. For making this change, the manufacturer has provided every convenience. Not only does the oversize fit the rim as perfectly as the regular size, but it also takes the same tube. Tubes, like rims, are now made interchangeable. Consequently the change over to the oversize will not require any changes or additions as to the tube equipment.

30 Per Cent. More Capacity

The oversize tire contains between 30 and 40 per cent. more air capacity than the regular size. This extra capacity makes possible not only a more effective air cushion to sustain the weight imposed, but higher resilience as well. An oversize tire naturally costs more than one of the regular size because it is larger. Its more effective air cushion, however, as well as the better distribution of road wear because of its extra width, insures still greater mileage in proportion to the initial cost. And so its use decreases the cost per mile; and cost per mile, rather than cost per tire, is the ultimate test of economy.—F. A. HENDERSON, Manager Adjusting Department, Goodyear Tire and Rubber Co.

Decisions of the Courts—Motorist Recovers Damages

By GEORGE F. KAISER

NEW YORK Court says that when a motorist has an unobstructed view along a street containing car tracks for 200 feet and he starts across without again looking for a trolley, he is not negligent as a matter of law since no car could then be in a dangerous proximity unless it was being run at an unlawful speed.

A motorist's car was on the west side of Broadway, south of 11th street. While attempting to turn to the north on the east side of Broadway his car was struck by a trolley. Before starting his motor he had an unobstructed view for 200 feet and he saw no car until he was in the middle of the track. A trolley came along at the rate of 30 miles an hour and before the motorist had time to reverse the automobile it was hit by the trolley. The motorist sued the trolley company and the Court said that where a trolley proceeds at an unusual rate of speed after an automobile is in clear view, the trolley company is guilty of negligence and must stand for damages caused by a collision.—*Brandt vs. N. Y. Railways Co.*, 147 *N. Y. Supp.*, 17.

Motorist vs. Garage Man

Michigan Court holds that a garage keeper's lien can be assigned to another person when he sells his business, and that the lien may be held to include freight charges which he has paid and an extra tire which he has furnished.

A motorist sued a garage keeper to recover his automobile which was held by right of lien by the latter. He had made arrangements with the garage keeper's predecessor to the effect that he would ship it to Muskegon where it was to be received and repaired. The garage keeper's predecessor paid $33.60 freight charges and furnished an extra tire for which he charged $50.75. Some time after a settlement was made and $75 was paid on account and it was agreed that the balance of $171.60 was to be paid before the car was turned over to the owner. After that the garage keeper went out of business and assigned his lien and claim for repairs. The motorist demanded the car without offering to pay his bill and when it was refused him he sued. The Court ruled that the garage man's successor had a right to keep it until the bill was paid.—*Gardner vs. LeFevre*, 146 *N. W.* (*Michigan*), 163.

Car Collides with Trolley

Court says that when accidents occur between a trolley car and an automobile, unless explanation is given by the trolley company, the fact of the accident is evidence of the trolley company's negligence.

In this case an electric car was coming south down grade at the rate of about 40 to 50 miles per hour, swaying from side to side. Plaintiff was going north on the same road, using reasonable care. The small wheel at the top of the trolley pole left the wire when the car was about 400 feet from the automobile. The trolley pole broke off and fell against the left forward wheel of the automobile, causing it to turn to the right toward an embankment. The motorist expected the car to turn turtle and he jumped out and was injured. He sued the trolley company and recovered judgment for his injuries, the Court holding that in a case like this, unless the trolley company could give some good explanation, the fact that the accident happened showed that it was guilty of negligence.—*Hull vs. Berkshire Street R. R. Co.* 104 *N. E.* (*Massachusetts*) 747.

F. C. Billings Wrote Article on Wrenches

NEW YORK CITY, Sept. 11—Through an error made in correcting page 485 of THE AUTOMOBILE for September 10 before going to press, the signature of F. C. Billings, of the Billings and Spencer Co., Hartford, Conn., was omitted from the communication prepared by him and appearing in the Engineers' Forum under the heading "In Ordering Wrenches Mention Number and Style of Finish."

Sand Blast Has Variety of Uses

From a Paper Read by H. D. Gates Before a Meeting of Associated Foundry Foremen of New York City and Vicinity

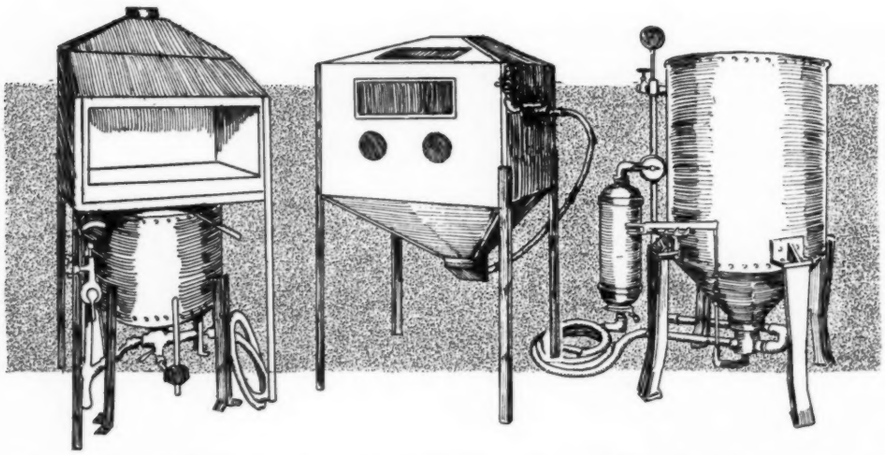


Fig. 1—Left—Combined pressure blast and cabinet. Fig. 2—Center—Continuous speed sand blast cabinet. Fig. 3—Right—Hose type pressure blast

WHILE the sand blast had its origin in the foundry for the cleaning of castings, its many advantages for cleaning or surfacing in all branches of metal working has given it a much wider use. Uncle Sam even demanded that the gates of the Gatun Locks of the Panama Canal be sand blasted before painting. Makers of automobile bodies in steel and aluminum are surfacing them before painting. With the increase in the use of the sand blast it is time to consider its economy.

The Purchaser's Problems

There is no question but there are today many sand blast machines and installations in use which are a loss to the user. Before purchasing a sand blast, it is first necessary to consider the material to be cleaned, what will be its average shape, size and weight and how many will be produced in a day. These and several other problems must be solved before the sand blast purchaser can determine if it is to be economical. If the work will not be uniform and will be in a wide variety of sizes and shapes, it will be impossible to use any but the old stand-by, the hose type of machine. This will clean everything and anything, though not always with the best economy.

Sizes of Pieces an Important Factor

Assuming, however, for the moment that the volume of the different classes of work is sufficient to warrant the use of an automatic machine, there are in general, two types for selection. For small work, the barrel type of machine shown in Fig. 5 will be unquestionably the most economical. The air volume required will, of course, be governed by the number and size of the nozzles and actual comparison of cleaning time with different size nozzles is the only way to determine the most economical for various classes of work. A single nozzle in larger size, of right design, construction and location, giving correct application of the sand stream to the work, will be found more economical in air consumption and power cost than multiple nozzles of smaller sizes.

Pieces too large for successful barreling but that will still permit of automatic handling, will be cleaned with least labor, on the round and reciprocating type table machines, of the type shown in Fig. 4. If, however, the pieces are of such shape or design as to demand constant labor in turning them to bring all surfaces under the action of the nozzle, the question of economy under these conditions requires the closest consideration before selecting this type of machine for varied work. On certain classes of material it is ideal.

Another consideration is that in many plants while the character of the work may be such as to be ideally handled by one of the different types of automatic machines, the daily volume may be so small that the unit cost of the automatic may put it out of the question. To meet such a condition, the small inclosed cabinet type of machine giving a continuous speed such as is shown in Fig. 1 will give a very satisfactory equipment.

The combination pressure blast and cabinet as illustrated in Fig. 2, also offers at small cost a highly efficient equipment for small volume work of a varied character. With this outfit the work can be accomplished in a practically closed cabinet while the outfit is still available for heavier pieces on the bench or floor as desired.

The Hose Type of Machine

Should the work of a particular plant not fall under any of the above heads, there remains one outfit that can take care of any kind of work even though at times a loss of economy on some portion of the output will result from its use. This is the hose type of machine shown in Fig. 3. This kind of machine is designed for the hardest kind of service, being able to clean metal and displace sand, rust or scale, some of

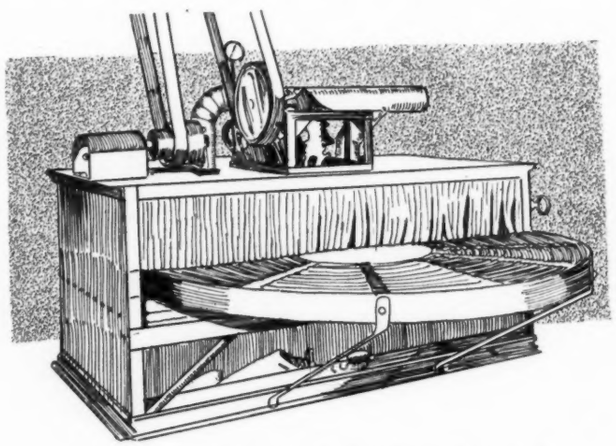


Fig. 4—Revolving table type sand blasting machine

which has fused and become almost as hard as the metal itself. The selection of this type of machine, unlike the automatics, should be made with reference to the nozzle equipment to be used. For instance, under 80 pounds pressure a 3/16 inch nozzle permits 48 cubic feet of free air to flow through per minute and discharges approximately 500 pounds of sand an hour. The air flowing through a ¼ inch nozzle is 85 cubic feet per minute and the discharge is approximately 900 pounds of sand in an hour.

Ample Air Pressure Needed

After the engineering department has calculated the type and size of the equipment necessary, the next problem to be undertaken is the question of air volume and pressure requirements. If the plant is without air, compressor equipment must be installed. In this, it must be remembered that it will be a mistake to buy a compressor adapted to barely meet immediate needs. Fully 90 per cent. of the foundries today are complaining of lack of compressed air capacity, and this is due to the constant increased demands which are made on the air plant once it is in operation. The greater first cost of an air compressor of large volume over the same type of small capacity is so comparatively slight that the provision of ample air to permit use of proper equipment for cleaning at the lowest cost per ton is undoubtedly advisable in the long run.

Undoubtedly, the satisfactory working pressure is the most mooted question among sand blast manufacturers today. There is one answer to the question, however, on which all agree and that is the pressure which is best is that which does the work cheapest. To determine this, it is of course necessary to know the exact purposes for which the blast will be used. If it is required only to remove the loose sand from a casting, a working pressure under 30 pounds will undoubtedly be successful even on iron and steel and would provide a surface suitable for painting. If, however, the pieces are to be machined, every particle of the fused sand must be taken off to expose the pure metal to the action of a cutting tool. On steel, up to 90 pounds will be required for most economical cleaning. Between these two extremes, the correct pressure must be determined.

In the test made by Prof. T. Magruder covered in a paper recently read before the American Society of Mechanical Engineers, it was shown that the time required to remove 1 pound of metal from a cast iron bar at 20 pounds pressure was 3.55 hours; at 30 pounds, 2.77 hours; at 40 pounds, 2.13 hours; at 50 pounds, 1.52 hours; at 60 pounds, 1.07 hours, and at 70 pounds, .82 hour.

The abrasive used is another factor in the economy of the blast. Tests show that lead shot and grit have approximately sixty times the life of sand. In an instance of use of grit with a hose machine, a steel foundry reports a loss of but 10 per cent. out of 3 tons at the end of 1 month. When sand was used, the daily loss by disintegration was 25 per cent. In another foundry the cleaning time required was reduced 20 per cent. by using shot. This seems logical as the metal abrasives have two and a half times the specific gravity of sand.

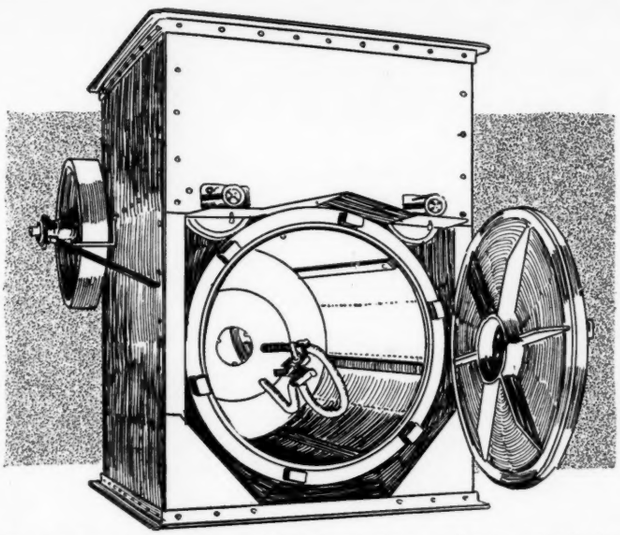
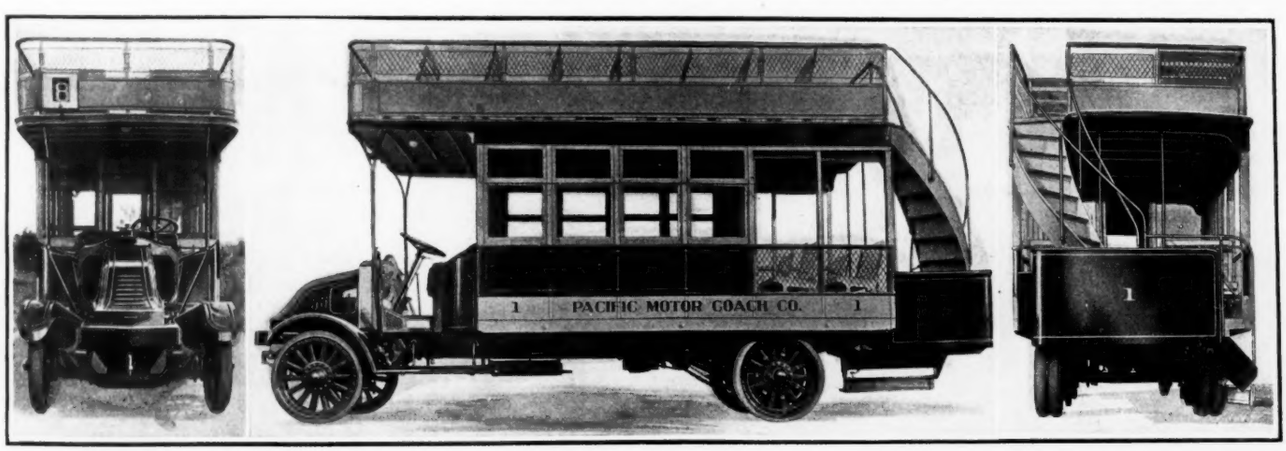


Fig. 5—Barrel type of sand blasting machine which is suitable for miscellaneous jobs

Records kept for a period of 6 months in this plant showed that with this same apparatus and under the same conditions the 1 pound of shot was equal to 20 pounds of fine silica sand.

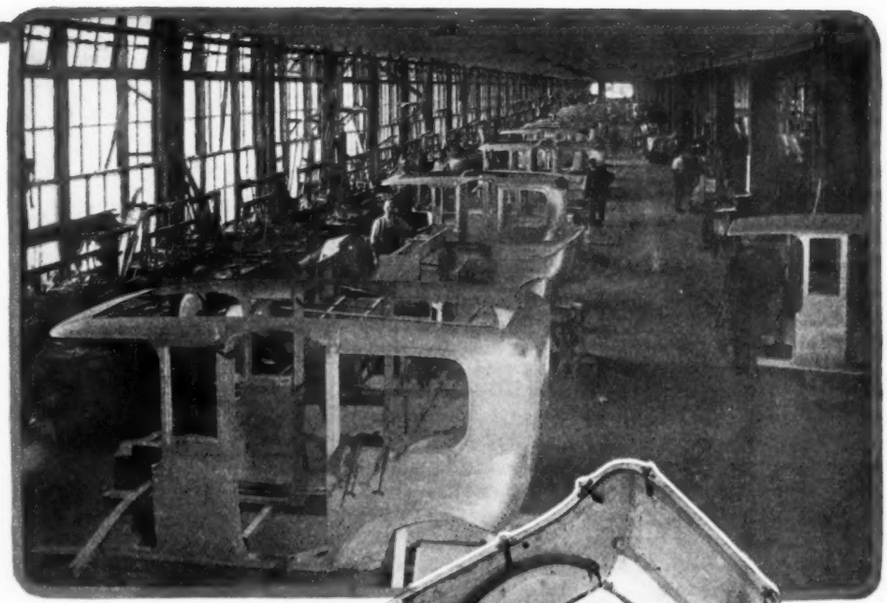
Care of the Machine

Care of the machine is the last but far from the least important advice given to the user of the sand blast. Methods of handling and screening the sand should be determined not only by the cost of power requirements, but by the efficiency of separation demanded. Some idea may be obtained of the relative value of different installation, from the fact that one steel concern using a plant provided with adequate ventilation with the abrasive handled, screened and cleaned automatically, was able to increase the output of its sand blast from 15 tons in 10 hours to upward of 18 tons in 5 hours. Routing of the material and handling methods are other items.



Front, side and rear views of one of the 3.5 ton Kelly Springfield buses to be used in Los Angeles, Cal. One hundred and four of these buses have been ordered by the Pacific Motor Coach Co., Los Angeles, Cal., and are to be operated in and around the city. The bodies were built by the St. Louis Car Co., St. Louis, Mo., and are unusually capacious. Seats for fifty-four passengers are provided—thirty on the upper deck and twenty-four on the lower, eight of these being on the open portion at the rear. A speed of 20 miles per hour can be maintained

Cast Aluminum Shells for Pierce-Arrow Bodies

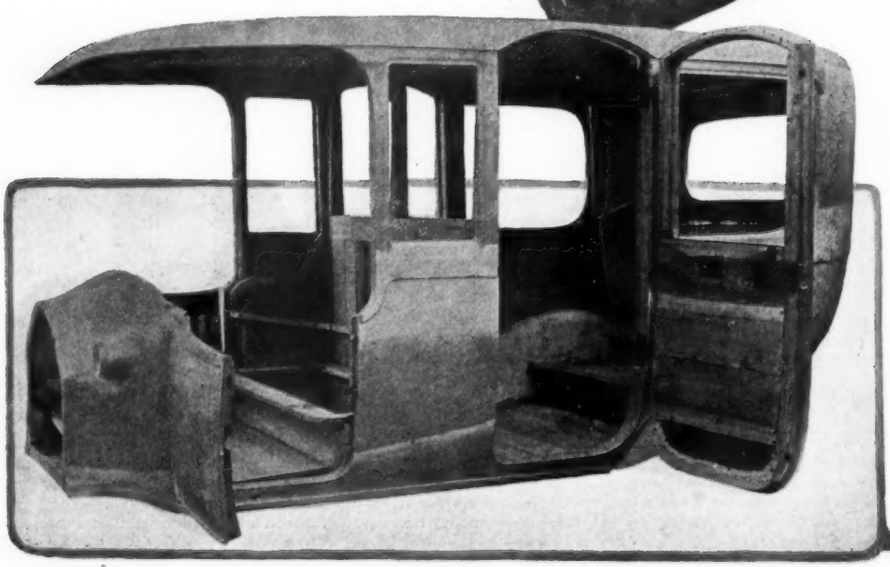


OFFERING a choice of fifty-four body styles, the Pierce-Arrow Motor Car Co., of Buffalo, N. Y., has set itself a task in body building that requires the efforts of special machinery and an immense floor area especially devoted to this branch of automobile manufacture.

The Pierce bodies are distinctive in that they are made from cast aluminum instead of from the sheet aluminum generally employed by body builders when using the light metal for their carriage work. The company believes that outside of securing a rigid piece of work by the use of the cast metal there is a further advantage in ultimate economy by the use of standard moulds.

In the accompanying illustrations are shown the shop in which the body work is carried on and examples of open and closed car practice in cast aluminum. In practically every case the cast metal is used in preference to the sheet construction by the Pierce company. There is an exception, however, to this and that is where bodies of such individual design are ordered that the cost of moulds and pattern work would make the price of the single cast body prohibitive.

The various cast sections are riveted together and the heads of the rivets then taken off flush with the surface of metal. The cast aluminum is then filed and scraped, giving a smooth working surface for the painting which follows. When all the parts are joined together the aluminum shell is sent to the wood workers to receive its backing of ash.



It is stated that these bodies are lighter and more serviceable than sheet metal ones. They are rigid and do not drum from vibration, or warp or buckle from extreme changes of temperature. Their rigidity is also a great protection to the finish as there is no danger of the paint cracking. Another feature is that the mouldings are integral.

The Ideal American Six

Should Have Efficient 4 by 6-inch Motor, Flywheel in Front and Expanding Brakes, Says A. Ludlow Clayden, M. I. A. E., in Paper Presented To S. A. E. at Cape May

AT the present time the position of the six-cylinder car in Europe forms a very interesting study. It is doubtful whether anyone can forecast its future. There was a day when high power was obtainable only from a large car by means of using six cylinders. But at the present time, methods of manufacture and principles of design have undergone so much alteration that numerous high-powered four-cylinder cars, which are quite as smooth and pleasant to handle as the best six-cylinders, are coming on the market. Further, there are a number of difficulties peculiar to the six-cylinder construction. The vexed question of six-cylinder carburetion has never been settled. The difficulty of eliminating periodic vibrations with the necessarily long crankshaft still remains pronounced. Also, probably owing to piston friction principally, the six-cylinder engine is invariably less efficient than a four-cylinder of equally good construction—efficient, that is to say, in the power to volume ratio. This means that for a given power a six-cylinder car must necessarily be considerably heavier than a four-cylinder. Add to this increased cost for a given power, decrease of available body space for a given wheelbase, or greater length and therefore cumbersomeness necessary to carry a bigger body, and most of the disadvantages of the six-cylinder car have been summed up. On the other hand, there are a few six-cylinder cars which possess greater smoothness than has yet been attained with any four-cylinder, owing to the undeniably better torque, but none of these cars is efficient. They are cars which, while suited excellently to bear elaborate carriage work and provide luxurious travel at moderately high rates of speed, are seldom found in the possession of men who drive themselves or take a great interest in the mechanism. From an advertising point of view the six-cylinder car appears to have been made the only possible thing for America. In Europe the six-cylinder argument is practically dead.

Sunbeam—Most Efficient

It is, however, possible that the present position of the six-cylinder car in Europe is misleading because no effort has been given to the production of a really efficient six-cylinder, except by the Sunbeam company; the 30-horsepower Sunbeam holds records which leave no doubt whatever concerning its efficiency. The method followed by such concerns as the Sunbeam company is, first, to produce highly efficient cars and then obtain quietness, etc., without depreciating the efficiency. In this the Sunbeam and Vauxhall companies in particular have been remarkably successful. The Sunbeam is, of course, a small six-cylinder, but there seems to be no reason why the same methods should not be applied to a larger engine.

In making a new car for England or the Continent it would undoubtedly be far better to specialize on a highly efficient four-cylinder type and leave the six-cylinder entirely alone. On the other hand, it seems that for a new American car the so far untried scheme is the production of a highly efficient six-cylinder. The specification hereunder is a suggestion for the main characteristics of such a chassis.

Should Have 4 by 6 Motor

The dimensions should be certainly not more than 4-inch bore by 6-inch stroke and there would be several advantages in adopting 3½-inch bore by 5½-inch stroke; this latter size would be capable of giving as much power as the largest American six-cylinder engines if the engine were made in accordance with European principles. The advantages of the smaller dimensions would be less weight, lower cost, greater ease in eliminating vibration and less overall length.

The cylinders should be cast in threes with the valves all on the right-hand side. The three-cylinder blocks are quite handleable by one man; can be rigged in position quickly and easily; are not so likely to be bad castings owing to having less complication than a block of six; need not actually require more machining if care be taken in the design; and, finally, are much easier to remove and replace. When four-cylinder blocks were first introduced there was much complaint in certain quarters that private owners would find them very awkward to take off, and undoubtedly there was something in the objection. A six-cylinder block needs very elaborate tackle and several men to remove it from and replace it on the crankcase for cleaning with the pistons in position. Of course, this is not an objection that the ordinary buyer thinks very much of until he has to take the engine down, but when he does he never forgets it. Also, in my opinion, a six-cylinder block looks very heavy and rather clumsy. However, this last is not a point of great importance.

Generous Water-Jacketing

The water-jacketing should be sufficiently generous to enable thermo-syphon cooling to be satisfactory with an atmospheric temperature of 80 degrees Fahrenheit in ordinary country. In the cylinder blocks the passages to the intake should be cored and carried through the water-jacket to the opposite side to the valves, bringing the carbureter on the left-hand side. Between the carbureter and the cylinder castings the shortest possible pipe should be used and this also should be jacketed in a manner ensuring ample circulation of hot water. Although the word pipe has been used it is better to employ a box big enough to contain one or more cylinder charges, or else to use a circular loop pipe, as has been illustrated frequently on various racing engines, and as is used by the Austin company notably. It will probably be necessary to experiment with different inlet-pipe arrangements, as different engines do not appear to be suited by precisely the same design.

Returning to the cylinder castings, these would each have a water inlet at the bottom on the same side as the carbureter. There would be the usual cast dome for a head, and in addition the Napier practice should be followed of taking two pipes from the jacket immediately adjacent to the valve-pockets, joining these and leading them up to the radiator separately from the main outlet. This has been found to make a very great difference in engines used in mountainous districts, as it prevents entirely the otherwise always-present danger of formation of small pockets of steam in corners of the valve-jackets, it being almost impossible to cast cylinders without risk of a few traps of this nature.

The crankshaft should have seven bearings because, although it is possible to make a fairly satisfactory engine with a smaller number, the best possible running cannot be obtained unless the supports for the shaft possess the maximum of rigidity and this can only be the case with seven bearings. The diameter should be not less than 2½ inches, this applying to both the main journals and the crankpins, while the webs should be proportionally stiff. Weight should not be spared in the crankcase, as the success, or non-success, of the six-cylinder engine depends almost entirely on the absolute rigidity of this portion. Very stiff webbing to support all the bearings is therefore recommended, and the case itself should be distinctly on the thick side. Distribution gearing should be by inverted-tooth chain. A chain 3 inches wide is recommended; 2½ inches might be regarded as the minimum. There are various methods of adjustment, and adjustment is deemed to be essential, not for the use of the owner of the car, but for convenience in manufacture. There would be, of course, a crankshaft pinion, the camshaft wheel, and at least one other. Whether this should drive the water pump and magneto direct or whether the third pinion should be made in one piece with a skew gear driving a cross-shaft for these two accessories, would depend upon the general layout decided upon. If it is possible to dispense with the cross-shaft a certain amount of manufacturing cost is, of course, avoided. On the other hand, usually with large engines the magneto and the pump are brought into the most satisfactory and most accessible position by the use of a cross-shaft, more especially when it is necessary to keep the magneto high. The pump might also be inserted directly in the cylinder casting by leaving the front end of the cylinder open and bolting on a bronze or aluminum casting carrying the pump and fan. This would add a facing operation, but I believe it would save in the long run, as the machining of the pump chamber and the bearings for the fan can be carried out far more expeditiously on a small piece than on the whole cylinder block.

Exhaust Header Separate

The exhaust branch should be a separate casting provided with one expansion joint between the two cylinder-blocks, and it should be kept high, so as to interfere in no way with the accessibility of the valves. Many European makers have made experimental designs in which the exhaust manifold was part of the casting. They have, however, always returned to the separate branch, which I think may be taken as sufficient evidence that the cast-in branch is not satisfactory. Supposing it is water-cooled, it is necessary to make it very big externally and also to increase considerably the amount of water carried. If, on the other hand, it is not water-cooled, it becomes much hotter than any other part of the casting; being hotter it is bound to expand and by expanding it cannot help distorting the cylinders. Even though this distortion be slight it is sufficient to increase piston friction and eventually bring about uneven cylinder wear. Further, in order to make the engine thoroughly efficient (and in my view an engine which is not thoroughly efficient is not worth introducing as a newcomer on an already well-stocked market), it is essential that the inside of both the exhaust and inlet pipes be as smooth as possible, as the resistance offered by roughness of surface is a great deal more than would ordinarily be expected. Owing to the rather complicated nature of the core it is impossible to get anything like a smooth interior with a one-piece cylinder and exhaust branch. Of course, foundry practice has improved enormously, but I am inclined to believe that there is a tendency to put too much on the foundry. Thus, in a six-cylinder block, owing to the large amount of metal to be poured, and the considerable contraction, it is possible for quite grave inaccuracies in wall thickness to occur which cannot be checked except by cutting up a casting and, of course, bad castings are sure to be those which one does not cut up.

Valves Enclosed

The valves will, of course, be enclosed under the usual cover-plates, but the tappets should be mounted in the cylinder foot. The tappets ought, in fact, to be situated in a shallow trough formed in the casting; that is to say, with the cover-plate removed there should be still left a sufficiently deep chamber around the tappets to contain oil which is bound to be exuded from the tappets. Tappets can be made without rollers, but to the detriment of cam durability, and to a certain extent to the detriment of silence. I do not quite see why this should be so, but undoubtedly it is true that the roller helps to keep down noise. It is advantageous to work the tappets in the nearest possible approach to an oil bath, and the arrangement suggested, although not easy to describe in words, is very simple on paper. The ends of the cover-plates should be curved, instead of using a flat plate butting against the end-pieces made with the cylinder casting, because these solid end-pieces render the valves at each end of a cylinder block extremely inaccessible. The curving adds a little to the cost but is certainly worthy.

The camshaft should be of a diameter corresponding proportionally to that of the crankshaft, and cams of the largest possible diameter which can be accommodated should be employed, partly for the sake of durability, but more for the sake of getting the desired valve diagram as nearly as possible. Valves should be not less than 2⅛ inches diameter.

Oil Ducts in Crankshafts

For lubricating arrangements the crankshaft should be drilled and oil supplied to each main bearing at about 30 pounds per square inch pressure. The oil would pass through the shaft to the big ends and no special means need be taken for lubricating the piston-pins or the cylinders. To prevent the access of too much oil to the cylinders the crankcase should be made with a false top. Immediately beneath each cylinder the only connection with the crankcase should consist of the narrowest slot through which it is possible to insert the connecting-rod, but the baffle-plates should not close the bottom of each cylinder individually. A method which has been employed very successfully is to extend the crankcase upwards above the baffles, which are cast in one piece with it, so that the cylinders stand open to a shallow chamber—say one inch deep—running the whole length of the crankcase and separated from the crankshaft by the thin web with the necessary six connecting-rod slats. This longitudinal chamber allows the air displaced by the descending pistons to travel along and ascend under the other three without passage through the oil-laden atmosphere of the crankcase proper. It has been found that ample lubrication is obtained when using high-pressure oil-feed, and with this scheme smoking troubles are overcome. In order to complete discussion of the system of lubrication it is necessary to anticipate a little.

Flywheel in Front

The suggested design includes a recommendation that the flywheel be placed at the front end of the motor instead of at the rear, as usual. The three lowest points in a chassis are the front axle, rear axle and flywheel, and it is easy to see that if there is a hump in the road of wave formation it will be easy for the hump to clear both the front and rear axles and yet strike the flywheel, owing to both axles being lower than normal just at the instant that the flywheel is over the hump. With the flywheel at the front end it would be protected by the front axle and over anything which the front axle would pass the flywheel would be carried also. Another conspicuous advantage, though not so important as the one just mentioned, is that consequent upon the fact that with a unit system

for the engine and gear-box the necessary enlargement of the casing around the flywheel is a source of considerable weakness, or, looked at from the other point of view, the necessary enlargement calls for a very great increase of weight in order to get sufficient strength. A smaller casting without the flywheel pit is cheaper in first cost and easier to machine. The arrangement also has several advantages when the fitting of an electric motor-starter has to be considered, but these need not be gone into in detail at the moment.

Returning, therefore, to the lubrication system, the deep end of the crankcase sump obviously ought to be at the forward end as close as possible to the flywheel; otherwise the principal advantage of placing the latter at the front end is nullified. There is, however, a difficulty in that the oil supply to the pump needs to be most certain while ascending a grade. It is possible that this difficulty is not so serious as it appears, but to decide it definitely without knowing the actual clearances and without setting out the design on paper with some degree of accuracy, is almost impossible. Assuming that there is difficulty, the best way of avoiding it would probably be to adopt the system employed on the six-cylinder Wolseley cars. Here there is practically no sump, the crankcase being quite shallow, sloping downwards slightly from each end to the center. Oil is withdrawn from the crankcase by a gear-pump and supplied to a box which takes the place of the sump and is in one piece with the crankcase and high up on the side. This suction pump is of large dimensions but of quite ordinary design and appears to be in every way satisfactory. From this box on the side of the crankcase—which is large enough to contain all the oil in circulation—the forced feeds to the bearings are supplied by a separate and smaller pump. Failure of the suction pump would result in the flooding of the crankcase which would be announced by smoke, and failure of the supply pump would, of course, be shown by the indicator on the dashboard. The extra pump, however, introduces no extra risk and merely adds a little to the cost. The operation of emptying the system, washing out the oil box and so on, is facilitated a little by the higher placing, and the filters likewise become more accessible. For the suction pump a gear pattern is probably the best, but it has a disadvantage for forced feeding in that the output is not easy to control, appearing to bear no very direct relation to the speed. For the Vauxhall cars, including the racing machines, piston pumps have always been used for the oil, and it is doubtful whether this type of pump can possibly be improved upon for any purpose. It is not expensive to make and is easy to set to give the desired feed.

Babbitt Bearings Used

Having discussed the lubrication system it is perhaps worth while to add a word concerning the bearings, which should be of babbitt metal and might be die-cast. One point, however, is essential and that is that the crankshaft should be fitted to these bearings by thoroughly efficient hand-scraping. For six-cylinder work the reaming system *could* be made to serve, but it is not possible to obtain really first-class results from it.

As to the piston, these would preferably be of cast iron with the pins oscillating in the small ends of the connecting-rods, for which latter there is nothing practically better than a good drop forging. Phosphor-bronze bushes on the hardest possible steel piston-pins give the most satisfactory results. For the other bearings the exact nature of the white metal employed would of necessity depend upon the nature of the steel used for the crankshaft. For a six-cylinder crank it is probably worth while to machine all the webs, especially in a seven-bearing crank whereof the clearances must of necessity be somewhat small. It is not, however, necessary that the finish on the webs be of a very high order, because it is regarded as essential that the crank shall be balanced on a running balance machine, and this naturally applies to the flywheel as well.

Clutch and Gear-Box

Having the flywheel at the front end of the motor makes possible a single casting or a single pair of castings (the top half and bottom half) for the crankcase and gear-box. It would, however, probably be more convenient to make a separate piece of the gear-box and the clutch-box. This could be decided definitely only after laying out the design on paper. A lengthy experience of clutches of every kind has led to the conclusion that the dry-plate clutch, in which one surface is steel and the other woven wire and asbestos compound, is the most satisfactory for cars of high power. The number of plates depends upon the diameter and the engine power, and can be decided on by experience. For mounting the clutch there would be an extension of the crankshaft and the shaft carrying the striking gear would preferably be placed beneath the center rather than above it. Such positioning enables long pedals to be used, giving big leverage, while it also clears the clutch completely from above and makes adjustments readily accessible.

It is assumed that the gear-box and crankcase would be bored after being bolted together, and therefore the main gearshaft ought to be perfectly in line with the clutchshaft. It is, however, recommended that a simple universal coupling, preferably of the spring-steel-ring or Schneider type, be employed as this is very easy to disconnect without taking down either part of the unit, and also reduces the accuracy in boring necessary by a small fraction of an inch. Naturally the clutch would be enclosed completely; the lid or cover giving access to it may be either an aluminum casting or a steel pressing.

Four Speeds and Reverse Needed

Turning now to the gear-box, four speeds with a reverse should, of course, be provided. Wheels with big teeth are preferred. Considerable width of tooth is also an advantage from the point of view of silence. The spigot should run on ball bearings, but the main shaft and layshaft may be mounted on either ball or taper roller bearings. The advantage of using the latter is that it eliminates the otherwise absolutely essential thrust race on the mainshaft. Concerning the arrangement of the gears, and the striking mechanism inside the box, no departures from the normal practice are considered, but the control should undoubtedly be in the center of the chassis, the gate thus coming immediately on top of the gear-box. Probably the best arrangement for the gear-shifting lever is to mount it on a ball which is automatically dirt-proof and self-lubricated. There are, however, disadvantages in not having a visible gate, but there is a design entirely adaptable for such a layout as the one under consideration.

It is not proposed to discuss axle arrangements at the present time, but it is believed that the best arrangement, considering the advantages and disadvantages of all systems, is to have a single universal joint behind the gear-box, contained inside a large ball, the latter forming the end of a substantial tube containing the propeller-shaft. This tube acts as the driving member, as a radius- and as a torque-rod. The arrangement can perhaps be improved by the addition of side rods, but they are in themselves troublesome in certain respects and it is doubtful whether the sum total of gain in having them amounts to anything at all. The possibility of side-sway from lack of rigidity can be overcome by the use of wide springs with well-proportioned eyes and carefully fitted shackle bolts. One essential of the arrangement suggested is that the ball be of thoroughly adequate diameter; somewhere in the neighborhood of 5 inches is suggested as about right for a car of the size under consideration. The universal joint contained therein would preferably be of the ring type with ball bearings, or again, taper roller bearings, as these

types appear to be everlasting. The torque-tube would, of course, be steel; the ball should be phosphor-bronze.

Steel Gearbox End

It now remains to consider the way in which the thrust from the ball should be applied to the car as a whole. It is suggested that the end of the gear-box be of cast steel and that the ball housing be machined in this. Near the forward end of the power unit on the sides of the crankcase would be a pair of substantial pads, placed vertically, to which a pair of drop forged arms could be attached. It would be possible to use the ordinary cast aluminum arms, but it is deemed preferable to take the drive through steel. The ends of these drop-forged arms would be turned spherical, giving balls about 2 inches in diameter, and a similar ball would be bolted firmly on the gear-box by a pair of long bolts passing right across the steel casting on either side of the large ball at the rear end. The necessary sockets would be placed on the side members of the frame for the front ends, and on a cross member for the back end. This arrangement would avoid the necessity of any dropped or bent cross members, thereby avoiding weakness and expense; would relieve the unit from all twisting stresses and provide ample area for driving. It might be an advantage to mount the socket for the ball at the rear end, itself on a swivel, so that the whole of the driving force would be applied through the two arms; this would dispense with the possibility of undue load being placed on any one ball through disalignment of the frame. Conversely, it might be preferable to take all the drive through the single suspension on the cross member at the rear and allow the front sockets a little swing. Probably convenience in manufacture and erection would be the deciding factor. One detail which has not been mentioned is that the universal joint should be allowed a little telescopic movement on splines, on either the propeller-shaft or the gear shaft. This would compensate for any inaccuracies in erection and also make it possible to withdraw the whole transmission by removing the back half of the cast steel sphere-casing. It might be pointed out that this latter provides a unit which can be fitted in the frame very easily, and which is entirely independent of any necessity for lining up to the rear axle. The system described is likewise a complete unit and the only great accuracy required in the spring mounting on the frame is to see that the two axles are parallel.

Steering-Gear on Crankcase

The steering-gear would be bolted to the crankcase on the left-hand side of the engine, as left-hand drive is undeniably the only possibility for American usage. This would leave the right-hand side of the engine very clear for obtaining access to the motor starter and the oil tank, if the Wolseley arrangement were adopted. It is suggested that if a cross-shaft is used the magneto should be so placed that its contact portion is accessible from the left-hand side. It is an advantage to have such parts as carbureter, magneto and lubrication details so placed that they can be all inspected at the same time with the minimum amount of moving about.

Engine control should consist of hand-throttle and spark lever on the steering-wheel, and also a well-balanced foot-throttle, so operating that the hand-lever controls the cut-off. The throttle-pedal should be situated immediately behind the base of the steering-column and between the brake- and clutch-pedals. An arrangement of steering-gear which allows for a slight adjustment for rake is also recommended, not to enable different angles to be obtained for different styles of body-work, but to allow the driver a little latitude as to the closeness of the wheel. This is a point which has been neglected very much indeed, but there is no doubt that a large man is far better suited by a wheel rather higher up and rather further forward than a small man. All that is needed is an arc of travel giving about 3 inches of movement measured at the top end of the column.

Electric Type of Starter

For the motor-starter it will be possible to fit an electric dynamotor either at the forward end of the crankcase on the right-hand side to mesh with the flywheel, or—and this would probably be much neater—on the right-hand side below the valve level and at the back end, taking the normal drive in the most convenient way, preferably by chain from the camshaft and using a small sliding gear or a little epicyclic train to provide a gear-down for starting. Yet another place where the dynamo can be fitted is on the side of the clutch-case, the outside of the clutch being toothed.

The carbureter is outside the scope of the present discussion. Just as with inlet-pipe arrangements, the best carbureter for any engine is usually found by a process of trial and error.

The only other detail of which no particular mention has been made is the water pump, the only requisite for which is that it should be sufficiently powerful to cope with any climatic conditions likely to be encountered. It should be of a centrifugal pattern which allows fairly free syphonic circulation, if the drive fails; it should have an easily adjustable gland, and a weak coupling between it and its driving-shaft, which will fracture readily should an attempt be made to start the engine with the pump frozen.

Force Fuel Feed

The method of fuel feeding probably most satisfactory is to force fuel by air pressure from a large tank through a small tank on the dashboard to the carbureter. This small tank will trap sufficient fluid to enable a start to be obtained and to give a few minutes' running without the necessity of pumping up the pressure-system by hand. To supply the pressure there should be a plunger air-pump, the clearances being calculated so that it is never possible to deliver air at more than about five or six pounds per square inch. This pump might be driven direct from the camshaft or incorporated with one of the oil pumps. I can quite understand that in America there is a liability for pressure joints to work loose, but even if a gravity dash-tank were used, I would prefer to maintain the feed by pressure, and in such case the pipes would be so short that I think vibration troubles need not be feared. One cannot obtain efficiency with a long inlet-pipe and it is impossible to avoid the use of a long inlet-pipe with a gravity-feed because the tank cannot be mounted at a sufficient altitude, even on the dash, if it to hold enough gasoline for 200 miles. It would, however, be possible to devise a dashboard tank with two compartments and to use the pressure merely to lift fuel from the bottom compartment to the upper one.

Band Brake Useless

The contracting-band type of brake ought not to be considered. It has only one advantage, which is that it is easy to make very cheaply. A band-brake is never powerful, never quick in action, never easy to adjust, invariably gives rise to rattle (as it contains of necessity a large number of joints which get lubricated principally with mud) and moreover is extremely unsightly. Granting that extremely good working surfaces for brakes are steel and woven material such as has been recommended for the clutch, the best arrangement from all points of view seems to consist of wide cast steel drums, ribbed for cooling, fitted to each rear wheel, and two sets of shoes side by side each faced with lining material, one pair operated by the hand-lever and the other pair by the right-hand pedal. Such brakes can be enclosed completely so as to be protected from dirt.

The best operating system is to run the two pull-rods slightly above the torque tube, actuating the expanding cams of the outer pair of brakes by means of shafts, taking one bearing in the brake bracket at each end and the other bearing in the differential case;

the other pair of brakes being controlled from tubes rotating on the outside of the said shafts. These are best situated above the axle and are neater and less troublesome to erect than cross-shafts on the frame itself. The ends of the operating arms would, of course, be connected by an ordinary compensating link. For adjustment and setting, hand-tensioning wing-nuts would be applied to the pull-rods and there should be some arrangement whereby the operating arms can be set relatively to the spreading cams, so that as wear takes place the levers can still be kept in a normally vertical position. It would be easily possible to arrange for the lubrication of the bearings of the brake-operating shafts at the inner ends, from the inside of the differential box. The bearings at the outer ends can be supplied with grease from the same cup that feeds the bearing between the spring table and the axle sleeve. Thus the whole of the connections should be lubricated by means of a single pair of greasers on the axle.

Steering-Gear and Control Parts

There is no doubt that ultimately all front axles will be designed with the steering swivel-pin inside the hub and in the plane of the wheel, because this arrangement removes all possibility of shock in the steering-wheel, gives absolute security on the roughest roads and enhances the durability of the steering-gear enormously. The only disadvantage is the necessarily large bulb which has been considered rather ugly. If such a matter is deemed important, care should be taken that ample ball thrust-bearings are provided in the swivel-pins and in the steering-gear itself. There is only one pattern of ball-joint for steering connections which is absolutely secure and this should, of course, be ample. For the control through the steering-column the simplest possible arrangement should be employed, as a great many controls which are used at the present time contain a very large number of totally unnecessary moving parts.

Balso Co. Considers Motor Condition in Specifying Lubricant

TOLEDO, O., June 22—The Balso Oil Co. of this city has taken up the lubricating problem in a new manner. In selling oil to the car owner the motor is divided into five zones of wear. The first zone is when the motor is new and the fifth is when it is worn out in the moving parts and just about ready for the scrap pile. Between these two extremes are the other three zones. The owner of the car first determines in what zone his motor lies and then proceeds to answer the questions on the chart shown in Fig. 1. This is mailed to the Balso Oil company's office and from it the particular needs of that owner are determined.

It is the aim of this system to meet the need of each individual motor. Only three factors in lubrication are noted, first the rapidity or tension of flow, second ease or rapidity of burning, third rapidity in scavenging or consuming the carbon.

The first is theoretically shown by the viscosity according to the Tagliabue viscometer at 70 degrees Fahrenheit and is practically shown by the ability of the oil to retain its correct flow past the rings of the piston at working temperatures. The flow of the oil is theoretically regulated in the laboratory as follows:

First Zone, perfect fit	230 Vis.
Second Zone, clearance 1/1000 of an inch.....	430 Vis.
Third Zone, clearance 2/1000 of an inch.....	630 Vis.
Fourth Zone, clearance 3/1000 of an inch.....	830 Vis.
Fifth Zone, clearance 4/1000 of an inch.....	1030 Vis.

or 200 points in viscosity per 1/1000 inch looseness or wear.

Second.—The rapidity of burning. This must be shown by the fire test, starting in the First Zone at 440 degrees Fahrenheit, advancing slowly in steps of 8 degrees in each consecutive zone, giving a 464 fire test in the Fifth Zone, which is very low, and in direct opposition to the theory of many engineers of the old school.

Balanced oil standing in the Fifth Zone in some instances has 100 degrees less fire test than many other automobile oils of equal viscosity.

Third.—Rapidity of scavenging or rapid decarbonization is shown by the tenacity of the carbon deposits, and their tendency to cleave from the metal and also by the rapidity with which it becomes incandescent from the heat of explosion.

In experimenting on the question of carbonization, the Balso company finds that too much attention has been paid to carbon content which ranges from 1 per cent. down to hundredths of 1 per cent. in distillates. This they claim to be a negligible quantity to a motor using a normal quantity of oil. When it was finally found that often excessive carbonization which was attributed to poor oil, really came from the carbon clinging to the metal, instead of being ejected, it became apparent that the quality of oil was important.

Carbon deposits show a wide range of consistency. Those from a high gravity high fire test oil being hard in consistency and difficult of expulsion, while those of the extreme low gravity and low fire test oil are more easily handled, having a cleaving action.

By experiment with different base oils the Balso company states it was found that the blends produce different consistencies. By working along these lines the company claims a balanced oil. The Balso company considers that the fight between the paraffin and the asphalt bases is interminable, the arguments on both sides being inexhaustible.

To bring out the points of its arguments the Balso company has issued a booklet entitled Bunco in which thirty-two pages are devoted to exploding various oil theories held by manufacturers, salesmen and owners. This book is designed to explain the value of the "zone system" of lubrication.

BALSO'S BALANCE SHEET

THE TEST CHART

For the Balanced Lubrication of all Internal Combustion Motors, with SPECIAL reference to Automobiles.

In which stage of WEAR do you consider your motor to be NOW? .....

Have you had the moving parts of the motor refitted or cleaned? .....

What was the opinion of the party who did the work? .....

What was your opinion? .....

Have you ever run your motor for any length of time when it was RED HOT? .....

If so, after that did you notice an increase in OIL TROUBLES? .....

How often do you wash out the Crank Case, putting in new OIL? .....

What did you do with the OLD OIL? .....

What Oil do you use mostly? Name.....Color: Lemon.... Amber.... Red....

What Oiling system have you? .....

Direct SPLASH from Crank Case? .....

Combination Direct with sight dash feed? .....

If any other kind describe.....

Are the Carbon deposits in the firing Chamber thin?.....Hard?.... Glassy? .... Thick?.... Soft?.... Dull?....

Are the Spark Plugs placed over the intake valve or side vestibule? .....

Are Spark Plugs over the piston entering the main firing chamber? .....

Is there any difference in the compression when the Motor is hot or cold? .....

Note here any SPECIAL trouble you have; for example: If one piston passes more oil than the others.....

.....

HOW MANY MILES ON A GALLON OF OIL?

HOW MANY MILES ON A GALLON OF GASOLINE?

NAME OF CAR ..... H. P. RATING .....

SUCH QUESTIONS AS YOU CANNOT ANSWER, LEAVE BLANK.

Sheet that owner is required to fill out

The Rostrum

Wants to Be an Engineer

EDITOR THE AUTOMOBILE:—1—I have just graduated from high school and wish to become an automobile engineer. Will you kindly advise me as to which of the following two courses would best equip me for the above vocation: The first course is a 3-year B. S. course at Columbia University, plus a 3-year M. E. course at the same place. The second is a 4-year M. E. course at Polytechnic Institute of Brooklyn, plus 2 years of post-graduate work in electrical engineering at the same institution.

2—Will you also give me any particulars that you are able to, as to salary, position, etc.?

Brooklyn, N. Y. J. MOZER.

—1—The selection of the proper school is a serious problem and doubly difficult for one just out of high school. We do not feel that it is our place to advise you as to whether you should go to Columbia or the Polytechnic Institute. This is something you should decide for yourself, and only after due consideration. You should obtain a syllabus of the courses offered by each school, and study both carefully. Compare the two. Find out how many hours each devotes to drafting and machine design, how many to mathematics and electricity and so on. Then go to these two schools, and become acquainted with some of the men in charge; tell them that you do not know which school to choose and get their arguments as to why their school is best. You will find the professors glad to advise you.

Examine the laboratory equipment, and find out how many of the professors of each school are holding important positions, and what their standing is.

Finally, weigh all the facts you have in hand carefully, and decide which school will teach you the most about the subjects you desire to have knowledge on, considering the number of hours devoted to these subjects, the personnel of the teaching staff and the excellence of the laboratory equipment.

2—As in everything else, the position that you will obtain after graduation and the success you will make in your line depends largely on yourself; on how much you learn in college and what ability you display to apply this knowledge.

It is impossible to give very exact information as to the salaries that are paid by the automobile factories, because the wages for a given position depend largely on the prosperity, size and generosity of the individual concerns. To give you a rough idea you will get from $12 to $20 per week at the start. In years you may work up to be chief engineer at from $5,000 to $15,000 a year, or more; chief draftsman at about $2,000; purchasing agent at about the same amount. A consulting engineer may make $10,000, or more a year. Five thousand dollars is a good salary for an experimental engineer.

A New Explanation for Overheating

Editor THE AUTOMOBILE:—I notice in your issue of Sept. 3 a letter from J. W. L. of Ogden, Utah, in which he states it is impossible to keep his motor from overheating, also that he is using "as lean a mixture as possible." In your reply you say a rich mixture will overheat a motor. Now I trust you will pardon me for contradicting you, but I feel compelled to say that this is not the case. A rich mixture will not overheat a motor, or at least any excess of heat developed would be so slight as to be negligible. On the other hand, one of the surest ways to overheat a motor is to use a lean mixture, and inasmuch as J. W. L. is using his as lean as possible it is no wonder that his motor heats.

I realize that a number of motor drivers do not agree with me on this point, but as a matter of fact it is not a question of personal opinion, but of fact. Even though I have always been entirely sure of my ground I have at various times made tests which have determined this beyond a possibility of a doubt. Moreover, if one will consider the matter for a moment, he will realize that the lean mixture must of necessity be the greater heat producer.

A lean mixture is a slow burning mixture while a rich mixture is not. This is clearly indicated by the fact that the former will fire back into the carbureter, while a rich mixture never does. A rich mixture fires with reasonable promptness or misses altogether, while a lean mixture never misses, but burns slowly, and the leaner it becomes the more slowly it burns. It is this slow burning, this constant flame in the combustion chamber, that overheats the motor. As a parallel I will cite the ordinary household gas stove, in which, as everybody knows, an intense heat is created by adding a considerable quantity of air.

Of course, the really correct way to determine this, as any other question, is by actual test, so I respectfully suggest that J. W. L. enrich his mixture considerably and abide by the results.

Detroit, Mich. F. R. PENDLETON.

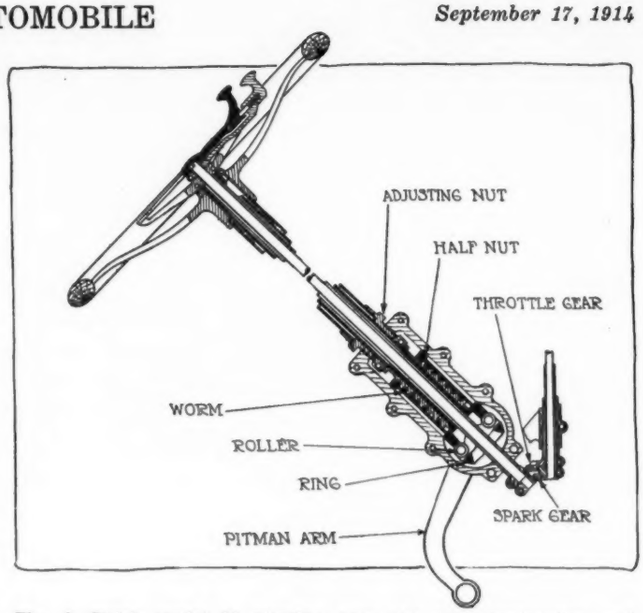


Fig. 1—Buick model 24 steering gear showing construction and adjustment

How to Adjust Steering Gear

Editor THE AUTOMOBILE:—1—Kindly give me through your Rostrum, a sketch of a Buick 24, 1913 steering gear, and its adjustment?

2—How does this steering gear operate?

3—Give me a sketch of how the holes are bored, how many and what size, around pistons to eliminate oil in the head.

Webb City, Mo. FRANK B. PATRUM.

—1—There is just one adjustment on this steering gear which is shown in Fig. 1. This is the nut which screws into the housing around the jacket. Tightening this nut acts on the ball thrust bearing and takes up all the back lash in the hand wheel. It should always be kept so tight that the wheel can only move an inch or so before affecting the road wheels.

Unless you are certain that the play is here, it is better to first lift the front wheels from the floor, so that the wheels are free to turn. Whether the wear is here, or in the tie rod or drag link, can then be easily determined. The latter is

provided with adjustable ball joints so that any play can be easily removed.

2—The steering gear is the part of the car that operates on the front axle to turn the road wheels in response to the movements of the hand wheel. Buick automobiles are equipped with an irreversible steering gear of the worm and nut type.

The steering gear consists essentially of the steering tube, to the upper end of which is attached the hand wheel, while the worm is keyed to the lower end. The worm meshes with two half-nuts in the housing, one of which has a right hand thread and the other a left hand thread. The ends of the half-nuts bear against two rollers attached to a yoke on a short shaft which projects out beyond the frame, and to the other end of this shaft is attached the pitman arm, which is connected to the third arm of the front axle by the drag link. The operation is as follows:

Turning the hand wheel also turns the tube and worm in the same direction, and as the worm turns one half-nut rises while the other descends. This pushes one roller down and allows the other to rise, thus turning the shaft and imparting the desired motion to the pitman arm, and so on to the road wheels.

The steering gear is said to be irreversible because, while the motion of the hand wheel is readily transmitted to the road wheels, the jarring of the road wheels over rough and uneven surfaces does not affect the hand wheel.

The worm, yoke, rollers and half-nuts are all enclosed in an oil tight housing which is bolted to the left side of the frame, and a ball thrust bearing in the upper end of the housing takes the thrust of the worm. The housing is kept constantly packed with grease and a pipe plug is provided on top for its renewal. A grease cup on the outer end of the shaft helps to lubricate the long bearing on the left side.

3—We would not advise you to drill the pistons. Set the rings so that the openings in them are about 120 degrees apart and you should have no more trouble unless, by some accident, the motor is defective. It seems most probable that the spaces in the ends of the rings are in line, thus offering an unbroken passage for the oil.

Gasoline Consumption High

Editor THE AUTOMOBILE:—I drive a 1913 Ford touring car which runs with usual power speed and smoothness but I am getting only about 12 miles per gallon of gasoline while I have previously made from 20 to 23 miles per gallon under the same conditions. The magneto tests good. Can you tell me the cause of this?

Sheffield, Vermont. CLINTON E. JONES.

—Anything that will use up power, or reduce the efficiency of your car, might cause this increase in fuel consumption. But before looking for the trouble, make sure that you are getting full measure when you buy your gasoline, and also that your speedometer is correct. The latter can be tested by running the car over a course of known distance and comparing the reading of the speedometer with the distance covered.

You may be driving with too rich a mixture. Cut down on the amount of gasoline fed to the carbureter and see if the consumption is not lessened, but without a decrease, and possibly an increase, in power. Make certain that there are no leaks in the fuel system. Just to be on the safe side it would be well to turn the gasoline off whenever the car is not in use, because there may be a small leakage, somewhere, that amounts up in time but is hardly noticeable.

Drive with the spark advanced as far as possible without the motor knocking. See that the spark plugs are in good condition and that the gaps are the correct size.

Next, examine the motor. The compression should be good, and if it is not the valves may need grinding or possibly the rings, pistons or cylinders may be worn.

It is possible that the high speed clutch is slipping, and by driving the car at a medium speed along the level, and then suddenly accelerating, whether this is so, can easily be determined. If the clutch is holding, the car will accelerate as rapidly as the motor.

Push the car over a level garage floor by hand and note whether it requires very much effort. It may be that the brakes are dragging or that there is excessive friction in some other part.

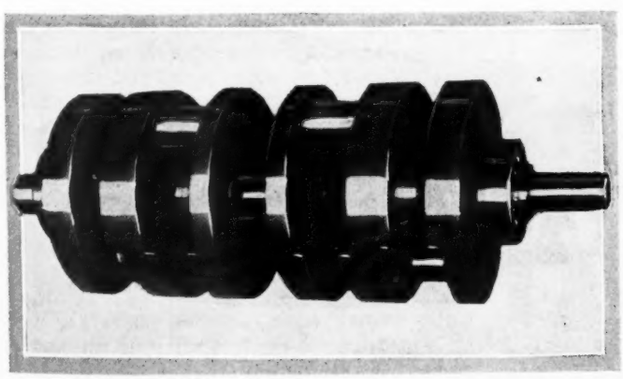


Fig. 2—Maxwell racing crankshaft. The disks connecting the crank pins supply the flywheel effect

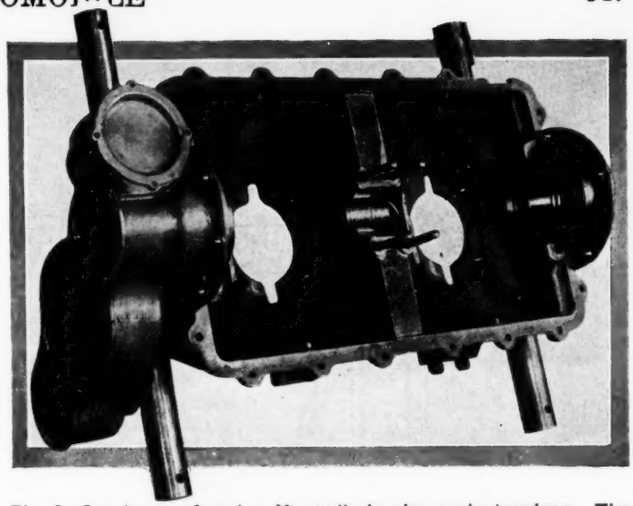


Fig. 3—Crankcase of racing Maxwell showing main bearings. The end ones are ball and the center plain

To Go from Reading to Butler, Pa.

Editor THE AUTOMOBILE:—Will you please let me know the best automobile route from Reading to Butler, Pa. I do not care to touch Pittsburgh if another route is just as good.

Kutztown, Pa. Q. D. HERMAN.

—If you follow good roads you will be obliged to go through Pittsburgh. Your route will lie through Harrisburg, Chambersburg, Redford, Greensburg, Pittsburgh, to Butler.

Maxwell Racing Crankshaft

Editor THE AUTOMOBILE:—Please show in a diagram how the Peugeot and Delage and Maxwells arrange their ball bearing crankshafts in their racing cars.

St. Louis, Mo. F. SMITH.

Fig. 2 shows the Maxwell crankshaft. Illustrations of the Delage or Peugeot crankshafts are not obtainable. Ball bearings are used only at the ends of the Maxwell motor, the center bearing being plain. The mounting of the bearings is clearly shown in Fig. 3.

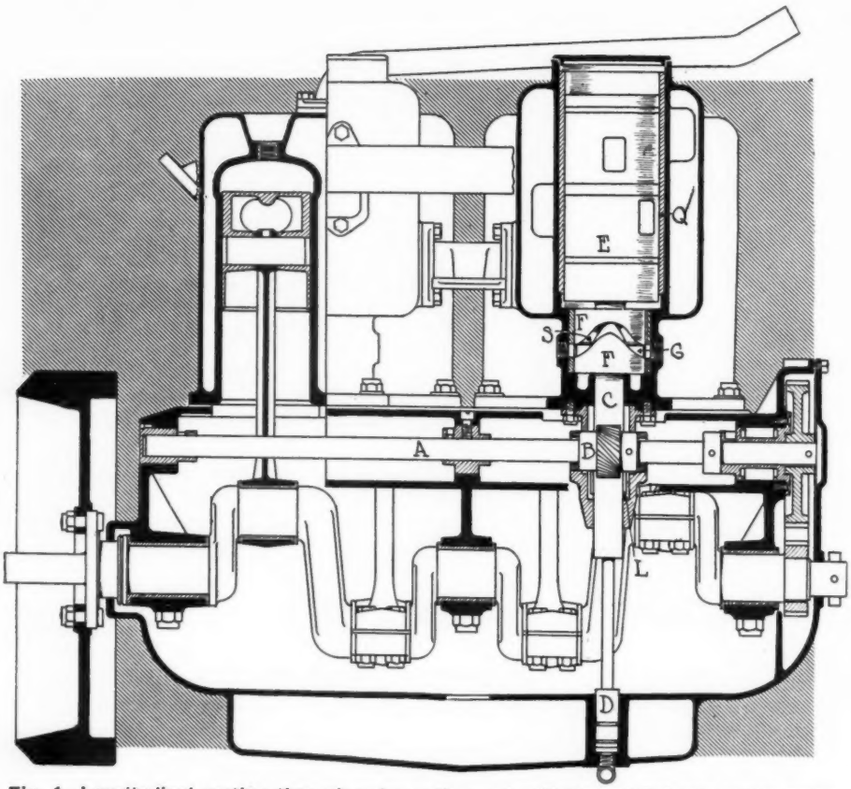


Fig. 1—Longitudinal section through valve action and cylinders of Doherty piston valve engine

Doherty Engine Uses Piston Valve Action

Follows Standard Construction

AN engine actuated by a rotating-reciprocating valve has been invented by H. B. Doherty of Wilkesbarre, Pa. The engine is really a modification of the piston valve design, in which a cored cylindrical valve performs the functions of inlet and exhaust for two cylinders adjacent to one another. That is, for a four-cylinder engine two piston valves are employed.

Spiral Gear Drive

Other than the valve and ports the engine is of standard construction. The valve, however, is different from any of the previous piston designs which have recently been brought out. A plan view of the layout is given in Fig. 3, showing the positions of the cylinders and valves. The valve is slightly larger in diameter than the bore of the cylinder and in position the two cylinders and the one valve resemble a three-leafed clover.

The ports through the cylindrical valve are so arranged that as it reciprocates the needs of one cylinder are first taken care of and then those of the adjacent cylinder. The first cylinder is controlled by the rotating part of the valve motion and the second cylinder by a reciprocating motion that is furnished by a cam.

The manner in which this valve is driven is as follows:

A horizontal shaft extending the length of the crankcase and corresponding in its action and drive to the cam-shaft of the ordinary poppet motor is fitted with two spiral gears to take care of the drive of the valves. The horizontal shaft A, Fig. 1, is driven by spur gears off the crankshaft and by means of the spiral gear B rotates the vertical reciprocating shaft C. The shaft C carries the valve with it in a rather unusual manner. The vertical shaft C is provided with a feather L on each side of the shaft, permitting the gear which meshes with the spiral gear B to slide vertically upward and downward on the reciprocating shaft. At the top end of the shaft is the valve E which is fastened to the shaft.

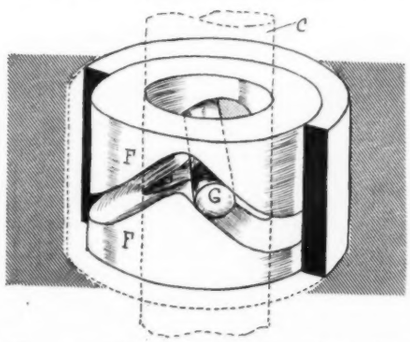


Fig. 2—Drive of rotating-reciprocating valve

One-Inch Travel

The reciprocating action of the sleeve is accomplished by the drive from the spiral gear which rotates it and permits of the action of the cam slot S on the pin G. The action of this cam is to give the sleeve a reciprocating motion of 1 inch, besides its rotary action.

In manufacture the accuracy of the port sizes is insured by the use of a liner Q which is inserted within the valve cylinder. In the liner there are four ports, one for the intake and exhaust of each of the two cylinders. The liner is fitted between the outside casting which holds the valve and the piston valve itself. Four junk rings make the joint tight between the piston valve and the liner.

Oil Pump Lubrication

Every time the valve is revolved once by the spiral gears it moves up and down twice on the cam. The valve ports are so spaced that one set is 1 inch below the other set, the difference in height being due to the reciprocating motion which is provided to furnish a sealing space between the openings for each cylinder. As the inlet valve for the first cylinder is opened by the registering of the ports, this cylinder draws in its charge and the valve continues until it has closed this intake by rotating a distance equal to the width of the port. It is then lifted by means of the cam and the next port in turn comes into position in front of the next cylinder. Thus the valve operates on two levels, finishing its work on the lower level for one cylinder and then being lifted 1 inch to perform its functions on the next cylinder.

The oil pump for lubricating the sleeve has been provided for in a very ingenious manner. The vertical reciprocating rod has been extended downward and at its lower extremity the plunger pump D has been fitted. On the bottom of the vertical rod for the other valve, another pump has been fitted for use in storing up pressure in the air tank.

In the manufacture of an engine of this design the construction is practi-

cally the same as in the ordinary poppet engine with the exception that the core work in the cylinders and valve is different from any other design. An idea of this is given in the accompanying illustration which shows a section through the piston and also through the cylinders and valve chamber. The inlet manifold is formed directly by cored passages in the cylinder casting manifold bolts directly to the outside of the casting, and runs vertically instead of horizontally.

Drilled Oil Passages

The motor is oiled by a force-feed system through leads which are carried from the plunger pump previously described. The cylinders are lubricated by the oil thrown off the crankshaft bearings. Oil passages are drilled diagonally through the crank sheets in connection with the force speed system. The area of inlet and exhaust is shown in the accompanying diagram and a chart of mean gas speeds through the inlet valve. The valve runs at one-quarter crankshaft speed. The inlet opens 10 degrees past upper center and closes 40 degrees past lower center, giving an opening of 210 degrees. The exhaust opens at 50 degrees before lower center and closes 10 degrees before upper center, giving an opening of 220 degrees.

The area of the ports and the mechanism for driving the valve with its combination rotating and reciprocating motion, are so designed that the curve of gas speeds through the inlet valve for increases in revolutions per minute, is a straight line. This curve is shown at the bottom of this page and it will be noted that at normal speeds of say 1,800 revolutions per minute, the mean gas speeds through the inlet valve will be about 20,000 feet per minute. This layout of valve ports with its straight passages and wide opening, should permit of exceptionally high speeds.

As will be noted from the horizontal section, the layout of cylinders and

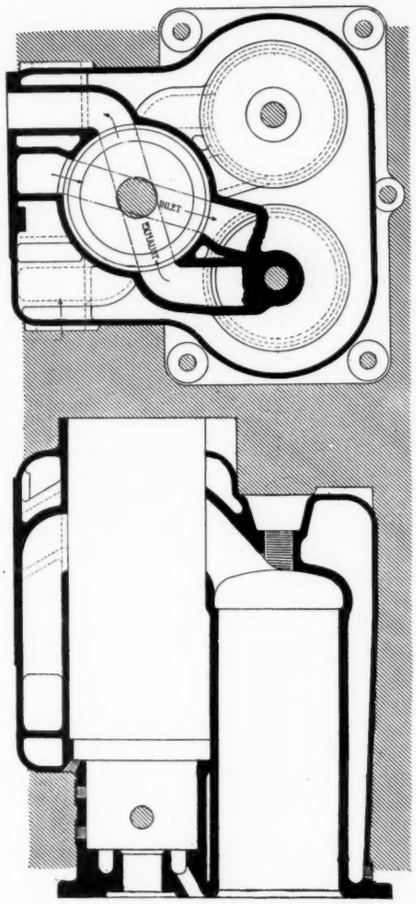


Fig. 3—Vertical and horizontal section through valve and ports

valve permits of ample water jacket space. Each passage through the valve serves as the inlet and exhaust for one cylinder and this is another factor in the cooling arrangement because the exhaust gases heat the passage as they pass out and the inlet gases in turn absorb this heat cooling the passage and at the same time becoming preheated.

No Leakage

The method in which the ports register with the opening in the valve is shown in Fig. 3. Leakage is prevented by the valve being provided with packing rings and also by vertical packing. The action of the cam in bringing the valve to registry with the different ports is clearly shown in Fig. 2. By elevating one port above the other, a very compact arrangement is secured without materially increasing the height of the engine.

—

Multiple Disk Clutches

These clutches are, as a rule, delightful, but, like most parts of a car, they need occasional attention. With regard to the type running in oil, it will usually be found difficult when starting from cold in the morning to engage a gear unless the clutch is held out an abnormally long time. A quick way is to press out the clutch and at the same time race the engine once or twice quickly. This will generally throw off the congealed oil and permit the clutch shaft to stop. On my car I have the pattern which runs dry with no lubricant, with steel and bronze alternate plates. Occasionally the plates refuse to separate, and the clutch will not stop spinning when the pedal is pressed out. The remedy is to prop the clutch out of action, squirt paraffin between the plates, run the engine to throw off surplus paraffin (with clutch still disengaged), then wash out with gasoline, paraffin having a tendency to rust steel. As soon as the clutch becomes "dirty," it will refuse to stop, hence the noise when engaging the gears.—*T. Haley in The Autocar.*

—

WHEN a car has been in service for some time it generally develops annoying little squeaks here and there about the springs and body. The owner or driver will find it well worth while to get rid of these, as the labor involved is slight and a quiet, smooth-running car is always desirable. Squeaks can generally be remedied by tightening the car parts affected or by the application of a little adhesive tape.

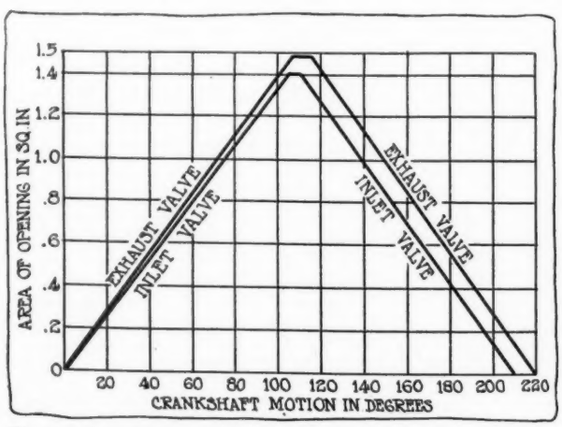


Fig. 4—Valve openings at different points on the crank circle

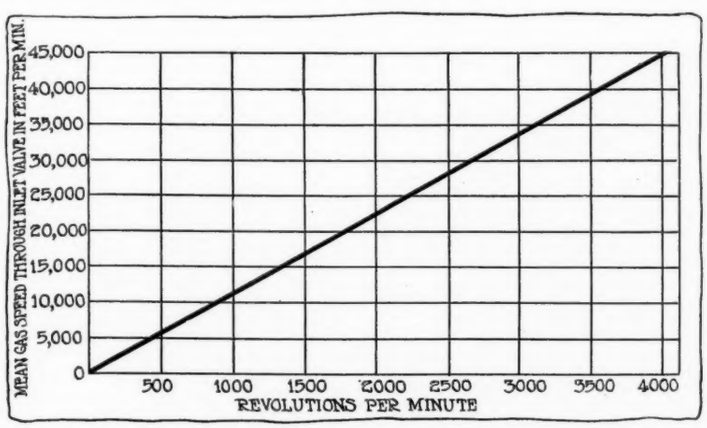


Fig. 5—Uniform gas speed increase with increase in rotative speed of the motor

New Books for the Engineer

Several New Works on Tools and Shop Practice — Metal Statistics for 1914 Published

MACHINE Shop Tools and Shop Practice is an excellent book for those interested in this work. There is also a book on tool making and one on American lathe practice, both published by the Norman W. Henley Company, the former being by Joseph V. Woodworth and the latter by Oscar E. Perrigo. Local Ordinances Relating to Speed and Traffic Regulations is a book written by Mitchell May, secretary of the state of New York.

MACHINE SHOP TOOLS AND SHOP PRACTICE. By William H. Van Dervoort, M.E. The Norman W. Henley Publishing Co., 132 Nassau street, New York City. Cloth, 552 pages; 673 engravings, $3.

This book, which is the sixth edition, is the outgrowth of a series of articles prepared by the author for the students in machine shop practice at the University of Illinois. An effort has been made to treat the subject in a clear and comprehensive manner, carefully avoiding all unnecessary matter and presenting to the apprentice and mechanic many points pertaining to the tools with which they come in daily contact, and about which they are often unable to obtain all the information necessary, in order that they may use these tools correctly and efficiently.

In treating on the various classes of small and machine tools, the author has endeavored to bring out much pertaining to the advantageous use of these tools.

The importance to the machinist having at least a limited amount of information on the subjects of Fastenings, Gearing, and Belting and Transmission Machinery has prompted the addition of chapters upon these subjects.

METAL STATISTICS FOR 1914. Seventh Annual Edition, issued by The American Metal Market and Daily Iron and Steel Report, the American Metal Market Co., New York City. 280 pages with advertisements; cloth.

Small enough to be conveniently carried around in the pocket this little book is designed for buyers, sellers, plant managers and engineers as a guide in purchasing both ferrous and non-ferrous metals.

The monthly production in tons and the average monthly price of the various classes of metals are given in tabular form. The statistics include figures on iron and steel, pig iron, finished products, scrap, copper, tin, lead, spelter, aluminum, antimony, silver, and miscellaneous.

AMERICAN TOOL MAKING AND INTERCHANGEABLE MANUFACTURING. By Joseph V. Woodworth. The Norman W. Henley Publishing Co., 132 Nassau street, New York City. Cloth, 531 pages, 600 illustrations, $4.

A "shoppy" book, containing no theorizing, no problematical or experimental devices, there are no badly proportioned and impossible diagrams, no catalogue cuts, but a valuable collection of drawings and descriptions of devices. In its 500 odd pages, the one subject only, Tool Making, and whatever relates thereto, is dealt with. It is a complete practical treatise on the art of American tool making and system of interchangeable manufacturing as carried on today in the United States. In it are described and illustrated all of the different types and classes of small tools, fixtures, devices and special appliances which are in general use in all machine manufacturing and metal working establishments where economy, capacity and interchangeability in the production of machined metal parts are imperative. The science of jig making is exhaustively discussed, and particular attention is paid to drill jigs, boring, profiling and milling fixtures and other devices in which the parts to be machined are located and fastened within the contrivances. All of the tools, fixtures and devices illustrated and described have been or are used for the actual production of work, such as parts of drill presses, lathes, patented machinery, typewriters, electrical apparatus, mechanical appliances, brass goods, composition parts, mould products, sheet metal articles, drop forgings, jewelry, watches, medals, coins, and so forth.

The treatment of each tool described and illustrated is such as to enable any practical man to design, construct and use special tools, dies and fixtures for the rapid and accurate production of metal parts, interchangeably.

FACTORY LIGHTING. By Clarence E. Clewell, Sheffield Scientific School, Yale University. McGraw-Hill Book Co., 239 West 39th street, New York City. Cloth, 160 pages, $2.

Beginning with a discussion of the requirements of satisfactory lighting, illumination design is considered with special reference to efficiency. Lighting installation work is taken up, the Underwriter's rules stated and methods of wiring described. There is a chapter on maintenance and the keeping of records in connection with this work. Then lighting under various conditions from all angles is considered. These conditions include office drafting, factory, power house, iron and steel mill, and machine tool lighting.

MODERN AMERICAN LATHE PRACTICE. By Oscar E. Perrigo, M. E., the Norman W. Henley Publishing Co., 132 Nassau street, New York City. Cloth, 424 pages, 314 detailed engravings, $2.50.

This is a new book from cover to cover. Written by a man who knows not only how work ought to be done but who also knows how to do it, and how to convey this knowledge to others. It is strictly up-to-date in its descriptions and illustrations, which represent the very latest practice in lathe and boring mill operations as well as the construction of and latest developments in the manufacture of these important classes of machine tools.

Lathe history and the relations of the lathe to manufacturing are given; also a description of the various devices for feeds and thread cutting mechanisms from early efforts in this direction to the present time. Lathe design is thoroughly discussed, including back gearing, driving cones, thread cutting gears, and all the essential elements of the modern lathe.

The classification of lathes is taken up, giving the essential differences of the several types of lathes, including, as is usually understood, engine, bench, speed, forge, gap, pulley, forming, multiple spindle, rapid reduction, precision, turret, special, electrically-driven lathes, etc.

LOCAL ORDINANCES RELATING TO SPEED AND TRAFFIC REGULATIONS. By Mitchell May, Secretary of the State of New York. J. B. Lyon Co., Albany, N. Y.; 110 pages; paper.

This is a convenient vest pocket pamphlet for the motorist that desires to keep informed on the different traffic regulations. The book is very complete, over 200 cities, towns and villages in New York State being included.

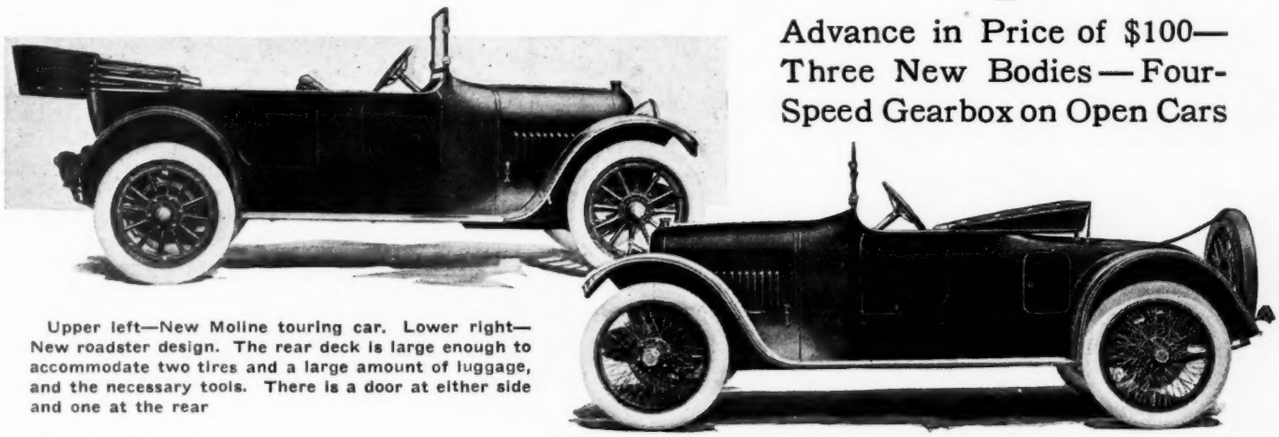
THE YOUNG MAN AND THE ELECTRICAL INDUSTRY is the title of a story, written by James H. Collins, the well-known magazine writer, which has just been issued by the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.

The little book deals with the opportunities afforded a young man in this industry and the different lines in which he may direct his activities as exemplified by the works of the Westinghouse Electric Company.

The company announces that it will supply a copy to anyone interested in it.

New Moline Sells for $2,500

Advance in Price of $100—Three New Bodies—Four-Speed Gearbox on Open Cars



Upper left—New Moline touring car. Lower right—New roadster design. The rear deck is large enough to accommodate two tires and a large amount of luggage, and the necessary tools. There is a door at either side and one at the rear

THREE important chassis changes, a rise in price from $2,400 to $2,500 and three additional body styles, a limousine, berline and roadster, briefly summarizes the difference between the new series Moline-Knight and that marketed heretofore by the Moline Automobile Co., Moline, Ill.

Of the three major chassis changes, one is in the motor, another in the gearset and the third in the rear axle.

The exhaust manifold no longer is an integral part of the cylinder casting and now is not water jacketed, this change having been made to obtain more efficient cooling of the cylinders and still leaving the trim appearance of the engine unaltered. The new manifold is held to the casting by ten bolts. To retain the symmetrical semblance an aluminum cover is placed over the manifold, this cover having the same contour as the intake manifold, hence the apparent likeness to the older motor.

Uses Four-Speed Gearset

Unit power plant construction has been abandoned in the touring and roadster models. The new series has separate units and instead of employing a three-speed gearset, a four-speed type with direct on third is used. The four-speed unit called for the separation of motor and gearbox and four-point motor suspension instead of three. The two points at the rear are rather close together and allow of proper movement through frame distortion. The adoption of the four-speed set brought with it the desired result of eliminating entirely the magnified gear noises, due to the sounding board effect of the rather large aluminum housing. This formerly inclosed both clutch and gearbox, and was an integral part of the motor crankcase.

Gearset on Sub-Frame

The new gearset is larger than the three-speed of the past series and its installation has necessitated the use of a sub-frame. The new position of the gearbox has resulted in the shifter lever, starting lever and emergency brake control being nearer to the front seat and as an added refinement a new type of lever mounting is employed which makes a much neater job than that used formerly. With these advantages of the new installation there is another, characteristic of four-speed sets with a geared-up fourth—the car's flexibility is increased. The car can be driven as low as 5 miles per hour on third, while the minimum on fourth is 7 miles.

The third change is one which will be appreciated by devotees of silent operating mechanism—the spiral bevel rear axle gears. This type of drive, introduced some time ago by the Packard company and which is in use by a number of makers so far, offers the advantages of both the worm and straight bevel gears and is said to be minus the disadvantages of either. Thus, in the Moline-Knight the last step has been taken toward reaching the ideal as regards a silent vehicle.

Minor Alterations Appear

Four further changes have been made aside from those just mentioned, but they are not of such importance as to call for a detailed analysis. The first of these minor alterations is the substitution of Whitney chains instead of those used in the past model, for driving the motor shafting, the second, the adoption of a screw-and-nut steering post for the worm-and-sector, the third the removal of the cranking motor switch from the motor casing and installing it as a separate unit, and the fourth change relates to the equipment and is in the form of a new single-cylinder Stewart power tire pump, instead of the two-cylinder pump of other make, used in the previous series.

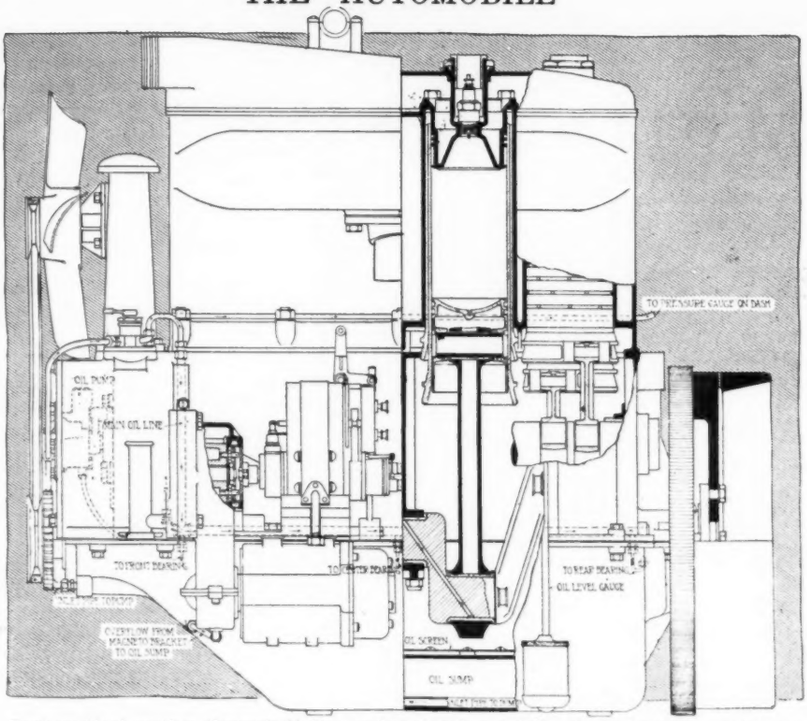
The Moline-Knight line for the coming season comprises a five-passenger touring car ironed for two extra seats, its price being $2,500 with $40 additional when the two extra seats are desired, a new two-passenger roadster with a cleverly designed body at the same price, a limousine at $3,800 and a sedan at $3,250, all of these being mounted upon a single chassis with a wheelbase of 128 inches. In the case of the limousine and sedan, as mentioned previously, a three-speed gearset in unit with the engine is used.

The four-cylinder Moline-Knight motor which created a sensation in January by running for 336 consecutive hours without a stop and with throttle wide open delivering an average of 38.3 brake horsepower has 4 by 6 inch cylinders and during its official test, showed a maximum of 53.6 horsepower at 1,682 revolutions per minute. This engine in its fundamental mechanisms is similar to most motors of its type, in that it uses an inner and an outer sleeve operated from an eccentric shaft in each cylinder, but aside from this it is at variance with other Knight practice. It becomes a particularly interesting piece of engineering when it is compared outwardly with other designs.

In the first place its cylinders are cast in block, the only

Knight engine so constructed in this country. This casting is a series of smooth gracefully curved lines, in a way, blending into one another and giving a first-hand impression of simplicity and after a prolonged look conveys the thought of ultra-simplicity.

The cooling water is circulated the entire length of the cylinder barrel through the intake manifold, around the cylinder head and the reciprocating sleeves, and even around the lower portion of the spark plugs. Every part calling for cooling surface is adequately supplied, and just how this is done is well brought out in the illustration showing the end section. Note how the spark plug is inserted into a recess in the cylinder head cover and how the lower portion of the plug has water circulating around it. The tops of the sleeves also are water jacketed in the head as shown. However, a departure from last season's practice is the absence of a water jacket around the exhaust manifold.



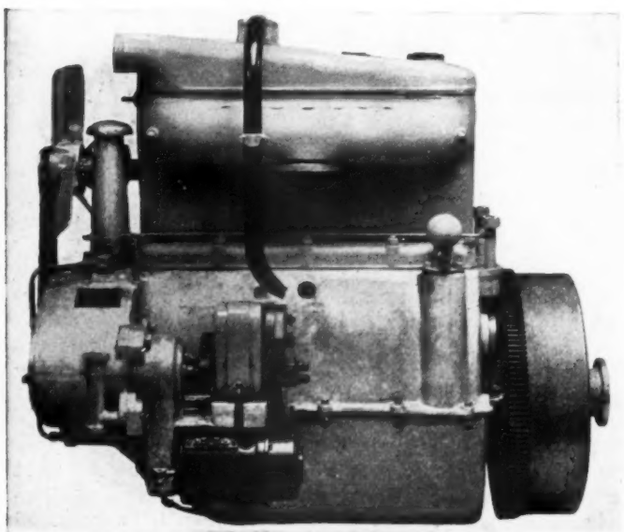
Part vertical section through Moline motor showing details of construction. Note the domed pistons and tubular connecting-rods. Oil ducts are drilled in the crankshaft

Thermo-Syphon Cooling

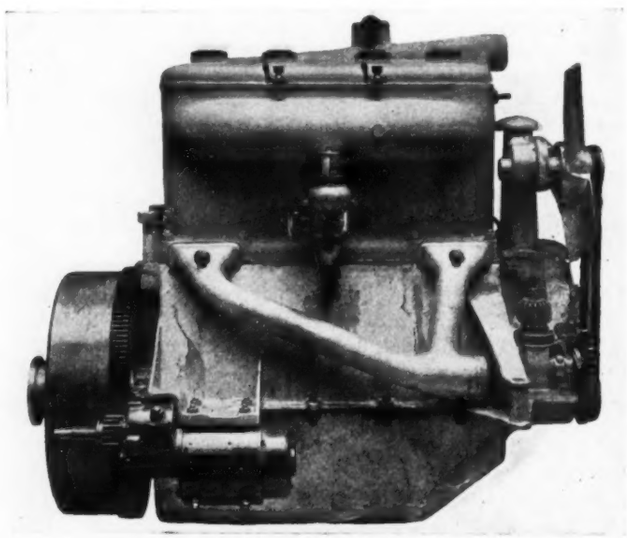
Water circulation is maintained by the thermo-syphon system, another instance of unusual construction, this being the only motor of its type which does not employ a water pump. The water in its path travels from the radiator through a two-arm manifold. These arms are attached to the lowermost portion of the cylinder block and the water passing through them is sent through the various channels mentioned previously and then returned by its natural course through the cylinder head cover which forms the return manifold. One should take particular notice of the relative size of the water pipes and the egg-shape of the motor brought about by the unusual jacketing.

Three bearings support the crankshaft, the front and center being 2 1-8 inches in diameter, and 2 1-2 inches long and the rear 4 inches long, and 2 1-8 inches diameter. These bearings have no grooves. The crankshaft drives the eccentric shaft by silent chain, this method also being used for magneto and lighting generator shaft drive. The sleeves are operated in the true Knight fashion by connecting rods fastened to the eccentric shaft which operates on bearings 1 1-8 inch in diameter and 1 1-4 inch long. These sleeves have a maximum travel of 1 1-8 inches. The intake port is 3 3-4 inches long and 1-2 inch wide and the exhaust 5-8 inch wide and of the same length as the intake. The pistons instead of being flat are concave and this with the dome-shaped cylinder head form a combustion chamber which is a big step toward the ideal chamber—the spherical. Much interest lies in the lubrication of the parts of this engine.

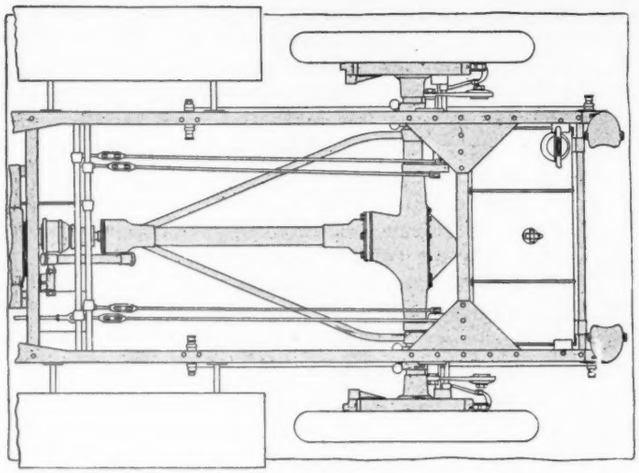
A gear pump forces oil at various pressures up to 40 pounds, dependent upon the motor speed, to every part of the engine requiring lubrication. Oil is drawn by this pump from a sump in the crankcase bottom, and forces it through a screen to a main oil duct shown in the end section of the motor. This duct, which extends along the entire length of



Left side of new Moline motor showing the mounting of the generator and magneto. The generator is under the motor arm



Right side of motor showing starter attachment, water piping, tire pump location, and three-blade fan



Rear view of chassis on new Moline showing triangular rear construction, gusseted frame and mounting of gasoline tank

the crankshaft bearing plate, is tapped at three points at each junction, a lead being sent to the main bearing opposite it. At the main bearing wrists, holes are drilled in the crankshaft, these holes leading to the connecting-rod bearings. The rod bearing holes register once every revolution with a hole in the upper portion of the connecting-rod bearing. This hole, however, communicates with the hollow connecting-rod, the diameter of the rod oil passage being 7-8 inch. This passage as will be seen from the end section view extends to the wrist pin which also receives the proper amount of oil. After the oil lubricates the pin it makes its way to the sleeves, oils them and then drops to the bottom, spraying as it leaves the lower portion.

Governor Controls Oil Pressure

The oil pressure varies with the speed of the motor the extent of the flow being controlled by an automatic governor interconnected with the throttle. This governor has a three-way cock which receives the oil before it is sent to the various parts. The governor openings are graduated so that with fully opened throttle the path is unrestricted, with closed throttle the discharge from the cock is back to the sump allowing little to go on its rounds and at intermediate throttle openings the flow is in proportion.

The Moline engine uses Bosch Duplex ignition, and a Schebler carbureter. The magneto sprocket acts as a means of adjusting the chains used in the motor. This is done by swinging the instrument on a pin pivot shown in an illustration herewith and thus chain slack may be taken up.

Cone Clutch Continued

The new series Moline uses the same clutch as was used in the older model, it being a cone, but this season with two universals between it and the new four-speed gearset instead of one. The change-speed lever is nearer the driver and a neater mounting is provided. From the gearset back the drive is through shaft to the new floating spiral bevel axle. Aside from the change in gear types the axle is as before.

The semi-elliptic, 60-inch rear springs placed under the axle housing are unchanged. Wheels carry 36 by 4 1-2 inch tires and wire wheels of the same size may be had at $90 additional cost. Left drive and center control are retained.

Wagner Cranking and Lighting

The cranking and lighting equipment of this car consists of the Wagner two-unit, 12-volt type with the generator mounted on the left of the motor directly below the magneto. The cranking motor is on the opposite side under one of the motor supports. The drive is direct through a pinion on the motor shaft and toothed flywheel. Initially a current of about 220 amperes is needed by the cranking motor but as soon as crankshaft rotation begins there is a drop to about 75 amperes. Current is furnished by an LBA battery under the front seat. Operation of the cranker is by a lever placed next to the gearshift lever and distinguished from it principally by its length, which is less than that of the gearshift control.

New Roadster Design

The touring body of the new series is practically the same as those of the preceding series, but with little refinements hardly perceptible, and yet thought necessary by the maker. The roadster body is one of unusual design, due to the generous curves of the lines. The rear deck is large enough to accommodate two tires and any amount of tools and baggage, a novel arrangement being a door on either side of the deck and one at the rear, the latter being used for tires and the former for baggage, etc. The cowl, hood and rounded-top radiator are well blended.

The touring car presents almost the same appearance as the roadster from the windshield forward. The touring body is of clean design with a bell back clean boards, and in a word is up to the minute.

Nothing is lacking in the matter of equipment, and among the features aside from the new tire pump may be mentioned, a one-man top, Hartford shock absorbers, electric horn, clock, and trouble lamp.

The standard painting is blue black, but with three weeks notice the Moline company will do a special job at $30 additional. If the body alone is to be special only $20 is charged, and if the hood, fenders, etc., are to be colored differently, $10 extra is asked.

—

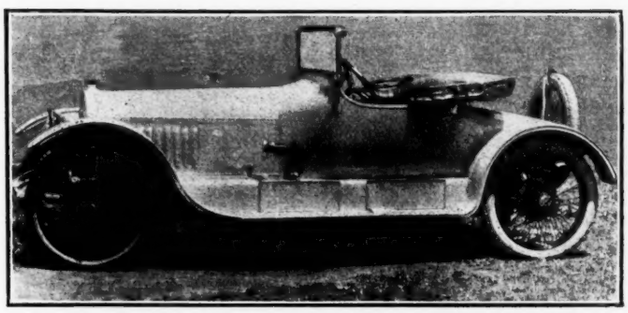
New Body on Doble Steam Roadster

A refined type of body has now been fitted to the steam roadster developed by the Abner Doble Co., Waltham, Mass. This car was completely described in THE AUTOMOBILE for April 9, 1914. It is featured by the fact that a honeycomb type of radiator is successfully used as a condenser, doing away with the difficulty experienced in previous steam engines in having to stop frequently for a renewal of the water supply. The car has a 25-horsepower engine geared, 1 to 1, and is capable of developing 75 miles per hour without showing any exhaust steam. At this gear ratio the car is capable of obtaining a speed of 60 miles an hour from a standing start in 15 seconds. The engine is a four by six single expansion, double acting type and has a Stanley tire tube boiler.

—

Combination Rubber Takes Over Keaton Tire

NEW YORK CITY, Sept. 15—The Keaton Tire & Rubber Co. has been taken over by the Combination Rubber Mfg. Co., this city, which will continue the manufacture of special brand tires and tubes, and take over the business in its entirety.



Finished roadster body on the Doble steam chassis

The Automobile

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Initiative Vs. Imitation

NOW that the eight-cylinder motor has become a reality as a component of stock cars in America it is to be hoped that there will not be a needless stampede from four-cylinder and six-cylinder construction to this latest factor in motor design.

Everybody was glad that after the single-cylinder motor the twin made its appearance; there was equal satisfaction when the four displaced the twin; a few years ago the rise of the six played its part in the rôle of evolving the eventual motor, or, at least, bringing us more in line with the course that leads to the eventual goal; and today the advent of the eight cannot but play its part in carrying the history of internal combustion progress nearer the end.

The days of the four-cylinder motor as a factor in the automobile world are far from numbered; the six-cylinder design is yet distant from its final stages of perfection; the eight is but in its swaddling garments.

There is a field for all, and initiative rather than blind imitation should be the watchword of many concerns. The superior advantages of the eight-cylinder over the six cannot be denied any more than those of the six-cylinder over the four-cylinder, or the four in turn over the two.

There are many other factors in the eight; its simple crankshaft, its short length compared with the six, the ability of the engineer to incorporate in it many of the factors that have been developed in the production of the present counter-balanced, high-speed, high-efficiency four; and against these are more valves, more valve parts and some factors.

One of our greatest builders set out a decade ago to develop a four-cylinder car and today he is the biggest producer in the world. Sixes have come, but with him it has been the working out of his own conception of what a rational motor car should be.

Let us have more of this stalwart individuality, an individuality, which between the lines, tells of a careful analysis of conditions as seen at the present and coupled with a sane survey of the factors that play their part in framing the future.

It takes backbone to map out any policy of individuality, in face of great odds. But sane individuality always will succeed, provided the three essentials of success are in the proposition: First, that you have a motor that has merit in it; second, that you have the men to design and manufacture and sell it; and, lastly, that the money is at hand to carry the organization along.

The eight has its broad and peculiar merits; so has the six, so has the developed high-efficiency four; let us have them all, until such time when the continued development of each to more nearly its maximum perfection is accomplished.

WE DO NOT WANT STAMPEDING, BUT WE WANT A DEVELOPMENT OF ALL TO ACCURATELY WEIGH THEIR RESPECTIVE MERITS AND DEMERITS.

The Wake of War

THE commercial vehicle is bound to develop more as a result of the present war than the passenger vehicle industry. There is today a staggering destruction of motor trucks of all kinds and also of horses in the war. With the closing of hostilities business will demand a replacement of these. Merchandise will have to be moved. Europe must have trucks. Many of her railroads will be more or less out of commission for a year, as their bridges are gone, their road bed destroyed in places and much of the rolling stock crippled.

In the cities the scarcity of horses will make itself conspicuous, and it will be at a high price that horses can be secured. The motor truck maker then will have his opportunity. He must have his vehicle ready, and he must be ready to meet the terms of the people. The American truck builder desirous of getting into the European market, and it is worth while, if for no other reason than the enormous field Russia offers, must be ready to meet long-term finance that is sure to follow in the wake of the war. Time payments up to 2 years will not be abnormal.

European factories in the majority of instances are already so disrupted that it will take 6 months or a year to get well re-organized. Much new help will have to be taken on, to fill the places of those who went to the front but never returned. American makers have a fighting chance, but they must be ready with the goods and with the business arrangements.

Trucks and Horses Destroyed by War

Tradesmen Back from Europe See Commercial Vehicle Boom for American Manufactories—Will Replace Railroads Temporarily

NEW YORK CITY, Sept. 15—John A. Olt, director of the export department of the Hudson Motor Car Co., one of last week's arrivals from Paris, where he has been for the past 14 months in the interest of the Hudson export trade to Continental Europe, looks for a heavy demand for American cars after the cessation of hostilities. This will largely be due to the great numbers of motor cars and motor trucks that are being destroyed in the present campaign.

According to Mr. Olt, everything is carried on with an unprecedented rush in military circles. Drivers do not stop to lubricate and give proper attention to their cars, so that up to September 4, the date of Mr. Olt's departure from Paris, as many cars were being abandoned in the war zone due to the carelessness of drivers as to mechanical difficulties. As soon as a car is incapacitated in this way it is generally destroyed, particularly when the army is retreating. What is needed today in France is more drivers rather than cars.

Trucks Will Replace Railroad

The need of cars after the war is over will be due to a variety of causes: First, many of the railroads are being destroyed and the roadbeds torn up. It will be months before these are repaired and in the meantime freight will have to be moved so that the demand for commercial vehicles will be particularly great. Second, due to the great slaughter in horses there will be a shortage in many of the industries after the war, and in many cases motor trucks will be called for. There should be a big market for a small capacity vehicle.

In the passenger car field many of the wealthier classes will undoubtedly want to purchase cars immediately after the war is over due to the fact that they have donated one or two of their machines for military use and where these are destroyed they will naturally purchase new ones.

Long Credits Necessary

Mr. Olt contends that the determining factor in American export business after the war will naturally revolve on the question of long credits and finance. The European buyers are educated in purchasing on time extending from 6 months to 2 years, and American exporters will undoubtedly have to revamp their European selling policy more or less in accord with these time-payment methods.

Few sales can be expected from the prosperous business man in Paris worth $50,000 or under. This class learned the terrible lesson of thrift after the war of 1870 and it is certain that the present war will not change their characteristics but rather tend to make them hoard still more. In commercial vehicles it will be different as industries will demand these and Americans should be in a position to profit by it.

Many exporting houses pulled in all of their European representatives as soon as the war situation became acute, which policy can only be considered as a mistake. Neutral countries are today asking for American cars and their confidence in those companies that have temporarily discontinued their representation will be considerably reduced. Europe is learning more and more the lesson that America has good cars. This war will temporarily set matters back but it remains with American makers to keep close to the European situation.

Mr. Olt says that Hudson cars, except those in the possession of owners, have not been commandeered by the government. There are several of them, however at the front, one being used by Capt. Rawlinson, a former Indian officer, but now in the service of Sir John French, commanding the British troops. This is the car that was to have participated in the Isle of Man races last June but which was disabled the day previous to the races.

To Organize National Dealers Association

MINNEAPOLIS, MINN., Sept. 12—It is the purpose of the Retail Automobile Dealers Association, of the Northwest, which has just held a 2-days' convention here, to have the organization become the National Retail Automobile Dealers Association.

Organized in 1913 as a state organization its officers have broadened its field and have made it a Northwestern association, including among its members the dealers from the Dakotas, Wisconsin, Iowa, Montana, and, of course, those of Minnesota.

The principal object of the association is to bring about the standardization of the automobile business through closer co-operation among the dealers, by education of the dealers on the matters which do not promote their interests but rather harm them. It appears from what one of the speakers at the convention said that many dealers still consider the automobile business as a little "game" instead of a serious business proposition.

The association will work especially to bring about the elimination of abuses and malpractices, such as the selling of cars at different prices when there should be only one price, or the selling of a car at the old price in one place and at the new cut-price in another place, the very same day the announcement of the new price has appeared. An effort will be made to convince the automobile manufacturers that it is not a good policy to announce their new models months before they can actually start to supply them. It will also be one of the objects of the association to urge the manufacturers to see to it that at local shows, or state fairs, only the new models are exhibited, and not old models which, however, might lead people to think that they are the new ones.

Trade Data Wanted By English Makers

NEW YORK CITY, Sept. 15—The dependence of Europe on the United States for automobiles and supplies in the present crisis is shown in a letter received today by THE AUTOMOBILE from Critchley, Evans & Co., London, signed by S. E. Barlow of that firm.

Mr. Barlow asks THE AUTOMOBILE to interest the American trade in sending catalogues and descriptive matter to his firm if the trade are desirous of supplying English makers with material. His letter reads:

"Owing to the present European crisis there is a state of temporary stagnation in the pleasure car section of the motor trade, but on the other hand the commercial vehicle makers are exceptionally busy owing to the large orders given to them by the War office.

"While in the pleasure car section there is sure to be a falling off in the demand during the period of war there is every reason to believe that soon after the declaration of peace the motor trade will become very brisk in this country, not only in the commercial vehicle section but also in the pleasure car section.

"Continental supplies of material are entirely stopped and the automobile firms in this country have to look for supplies of material to manufacturers at home. What effect the war will have as regards Continental supplies of material to this country is difficult to say at the present moment. The fact is that British motor firms will have to look for their supplies in this country, and may also be tempted to go to America. Now, therefore, is the time for American firms to do business here if they are able and willing to do it.

"Needless to say we are in as good a position if not better than most firms connected with the motor trade for introducing new sources of supply, particularly if they are of excellent repute. We have done a huge trade for continental manufacturers which has, of course, suddenly ceased.

"We shall be glad if you will get into touch with the large American suppliers of automobile material of all descriptions,

and ask them to be good enough to communicate with us as soon as possible, sending catalogues and all descriptive matter together with full information relative to their capacity and ability to supply firms here, if they are willing to do the business. Standardization of parts has only been adopted on an insignificant scale here and it is a question in the majority of cases of supplying material to meet English automobile makers' individual requirements.

"Owing to the great changes which are bound to come over the whole course of commerce in Europe, it is necessary to consider all possible sources of supply. We shall be glad therefore if you will ask suppliers to write to us direct giving us full information as soon as possible.

"We are interested in everything appertaining to the automobile trade. There must be a large number of firms requiring representatives here for the sale of accessories to wholesale and retail houses."

—

L. B. Kilbourne's $350 Taxi Ride

NEW YORK CITY, Sept. 12—L. B. Kilbourne, Chicago, Ill., financial partner with Chas. Y. Knight in the firm of Knight & Kilbourne, owners of the Knight sleeve valve motor patents, returned today on the *Campania* from a 3 months' visit in Europe, the last month of which was spent in Germany. One week of this month preceded the opening of war, followed by the first 3 weeks of the war. This time was spent in Baden in the southern part of Germany, and during the last week in August Mr. Kilbourne, in order to get out of the country, had to travel by taxicab from Baden up the Rhine valley to the Dutch frontier where he took a train to Flushing and thence by boat to England.

Mr. Kilbourne's taxicab ride, which cost him $350.00, is representative of the many experiences that American tourists have been through due to the European war. Practically an entire month was spent at Baden before a solution was arrived at as to how to get out of the place. Mr. Kilbourne and his party had arrived at Baden after a 1,600-mile tour through France and Switzerland, getting into Germany the day mobilization started. At that time he was on the Swiss-German frontier and was compelled to register himself, party, and chauffeur, with the German police authorities before he could proceed in his car from village to village. After this registration, and securing military passports, he toured to Baden, where 3 weeks were spent. It was impossible to leave this place with his car, which is still held there, and where his English chauffeur also remains as a prisoner of war. For the present, the chauffeur is permitted to live in the hotel where he is given the freedom of the town, but where he must pay his own bills. Should he not be able to do this he would be dispatched with other prisoners of war to some impounding depot.

Mr. Kilbourne's taxicab ride from Baden to the Dutch frontier was the only means of getting out. He was charged 1 mark, or approximately 25 cents a mile, and had to pay this sum for the out trip as well as the return trip. This one-way trip of 400 miles was up the Rhine valley, some of it through country over which the German troops had passed in their march to the front. The taxicab was not disturbed on its trip excepting being stopped at every village, town and city to show the necessary passport to the soldiers guarding these places. Every bridge was guarded by soldiers and here the transports had to be shown.

When passing through Coblentz, Mr. Kilbourne passed within a few yards of the castle where the German Emperor with his suite were stopping at that time. It was about 5:30 in the afternoon and the population of the city was on the street waiting for the Emperor to leave in his train of fifty motor cars which were drawn up in front of the castle. These cars represented every type of vehicle necessary for the Emperor and his staff, and included kitchen cars, sleeping vehicles, office quarters, etc. With such a motor equipment it would be possible for the Emperor to move his headquarters according to convenience and entirely independent of railroads.

Throughout the Rhine valley conditions seemed normal. The crops in the vineyards were being looked after, it being apparent that those needed to harvest the grapes and other products were left behind. Business seemed about as usual in many of the towns passed through, excepting Frankfort, the big financial center, where there was a greater air of dullness. Stores were open in all of the places, but theatres and other places of amusement entirely closed. In many places large forces of reservists were being trained in military camps.

The roads were practically deserted by motor cars excepting those used by officers of the different regiments, which were constantly moving about. These are all passenger cars of all types, and have the number of the regiment printed in large figures on the bonnet similar to the numbers on a racing car in a contest.

When traversing those stretches of road over which the army had passed, there were few evidences of military activity. These were largely confined to huge piles of empty tins by the roadside, these having been filled with food for the soldiers. At other places there were evidences of night encampments of cavalry.

Motor cars and horses are most in demand at present, and present indications would show that there will be a tremendous demand for motor trucks after the war is over because of the large number of horses that have been destroyed, these horses having in many cases been taken out of industrial fields which must be either supplied by more horses or motor trucks. There will also be an increased demand for motor trucks because of the large destruction of them that is taking place in the movements of the armies. This is largely due to the forced retreat, first of the allies, and later of the Germans. In these forced retreats whenever motor vehicles break down they are totally destroyed by a charge of explosive, rather than being left to fall into the hands of the enemy. This destruction means a heavy reduction in the number of vehicles in commission, and it is natural to expect that many of these vehicles will have to be replaced when the war is over.

When in England, Mr. Kilbourne visited the plant of the Daimler Co., Coventry, which plant has been working at full capacity since the declaration of war. Upwards of 100 workmen have been taken from the factory to join the colors, but others have taken their places. The factories have been working at capacity schedule on the 3.5 ton subsidized chassis and also on the 20 horsepower passenger car, which chassis seems specially suited for officers.

At present there is an enormous demand in England for magnetos, due to the fact that the English makers were great users of Bosch goods, which it is now impossible to receive from Germany. Already some English manufacturers have begun overtures with American magneto makers.

—

Patriot Presents Chandler Stock to Denmark

CLEVELAND, O., Sept. 10—The Chandler Motor Car Co., has received a letter from its Denmark distributors, Messrs. Mammen & Drescher, who are located in Copenhagen, which partly reads, as follows: "We have not a single car on hand as one of our wealthy patrons on learning that our Danish army was rather short on motor cars, bought our entire stock of sixes and presented them as a free gift to the government. If our stock had been larger he would have taken more cars. We are now entirely without your cars and wish you to rush our orders for immediate delivery."

In speaking about its foreign business, vice-president and sales manager C. A. Emise of the Chandler company said: "Our export business has already materially increased. Nearly every one of our foreign dealers outside of the war zone increased their orders for immediate delivery and we are at present enjoying a larger export business than at any time in our history."

—

For Uniform Automobile Laws in N. J.

TRENTON, N. J., Sept. 15—With the selection of Job H. Lippincott, commissioner of motor vehicles, as chairman, the commission named by Governor Fielder to consider municipal ordinances governing automobile traffic is completed. The commission adopted a resolution which outlined the scope of the work. It will examine the motor vehicle laws of every municipality with a view to the preparation of a model ordinance.

—

Briscoe Reduces Roadster Price to $785

JACKSON, MICH., Sept. 14—The Briscoe Motor Co. has reduced the price of its roadster to $785, completely equipped, instead of remaining at $900, as announced in THE AUTOMOBILE of September 10, page 513. The price of the touring car is also $785.

—

Benz Takes Over KisselKar for N. Y. City

NEW YORK CITY, Sept. 14—KisselKars and KisselKar trucks will be handled at retail in this city by the Benz Automobile Corp., which has taken over the salesrooms of the Kissel Motor Car Co., at 1696 Broadway with the agency.

C. H. McCausland, who has conducted the Kissel retail as well as Eastern wholesale business from 1696 Broadway, will continue as district manager, retaining his office at the same address. His territory will include, as before, the states of New York, Connecticut, New Jersey and Eastern Pennsylvania.

Big Program for Truck Convention

Industry to Be Enlightened in the Best Ways to Build, Sell, Drive and Maintain Commercial Vehicles at 4-Day Detroit Congress Beginning October 7

DETROIT, MICH., Sept. 11—The motor truck convention to be held in this city on October 7, 8, 9, and 10, gives promise of being one of the greatest motor truck conventions ever held in America. The work of drafting the program for the 4 days was practically completed last week, but as yet definite announcements giving the names of the people who will present the different papers cannot be made until the acceptances from these people have been received.

The program for the 4 days is particularly exhaustive and has been drafted with the object of taking up questions of direct value to the truck maker, the truck dealer and the truck owner. These questions are on pertinent subjects rather than academic.

The opening of the convention on Wednesday afternoon will be given over exclusively to manufacturers when subjects of direct value to them will be handled.

Thursday will have forenoon and afternoon sessions on subjects which concern both manufacturer and dealer.

Friday will be dealers' day and will be largely given over to questions of truck guarantees and service that manufacturers and dealers should give. These questions will be handled by representatives of the manufacturers and also dealers. Many dealers have been invited to come specially prepared to participate in the discussion.

Saturday forenoon will be clean-up session on subjects that have not been completed during the 3 previous days. There will also be a discussion of pertinent business subjects such as the necessity for dealers' organizations, the desirability of some form of motor truck exhibitions and other questions that may be brought up.

Although the exact order of the program cannot be given many of the subjects are now definitely decided upon.

The Trading Evil a Topic

"The Trading Evil" will be handled by one or two makers and several dealers. This is considered one of the most pertinent topics and in a canvass made of several hundred dealers, this subject is paramount with them. Dealers have been allowing too liberally on used trucks. The object of the paper and the discussions will be to show how this evil can be reduced, as well as offer means for making this business more profitable to the dealer.

"Evils from Overloading and Overspeeding and Avoiding Too Heavy Bodies" is a subject to be discussed. Manufacturers, dealers and body makers have been invited to prepare short symposiums on different aspects of this question. Axle and spring manufacturers have also been invited to participate.

"Used-Truck Market Reports" has been listed as a subject. The recent "Used-Car Central Market Reports" published by the Chicago Automobile Trade Association has resulted in the suggestion that similar reports be arranged for the motor truck field. It is believed that such would be of value and would serve as a guide to the dealer who is not familiar with value of used trucks.

"Traffic Engineering" will be handled by at least two experts in this line. Their papers will tell how the dealer can improve his conditions in this way.

"How to Calculate Costs," a question many manufacturers and dealers are asking themselves, will be analyzed in special papers by at least three traffic engineers who specialize in this work. Their papers will be direct and valuable, so that much of the information given can be applied at once by the dealer. Many dealers have been invited to supplement these papers by their own experiences.

Shall Trucks Be Sold on Terms

There are few questions that have been more widely discussed during the past 2 years than that of "Time Payments on Trucks." One professional financier who specializes on this work has been invited to outline his method. A leading manufacturer who sells direct on time payments will outline and defend this scheme. Makers and dealers who are opposed to this method of selling have been invited to prepare short papers for discussion.

"Territorial Lines for Dealers" will be handled by two or three makers. There is a movement to restrict dealers' territories and demand more intensified selling efforts. This aspect of the question will be discussed. The problem of carrying adequate supply of parts for trucks sold is one that enters into this topic.

"Tires for Motor Trucks" will be one department of the convention to be handled by four of the leading truck manufacturers who have been invited to prepare papers specially for the benefit of makers and dealers. They have been allotted different aspects of the tire questions.

One manufacturer has agreed to present a paper entitled "Parts to Be Carried in Stock by Dealers." His paper will go into the many ramifications of this subject.

It is expected that the question of "Manufacturers' Guarantee and Service" will occupy all of the Friday morning program. This is a question for manufacturers and dealers and will be handled by a leading truck maker and also by a leading dealer. Many dealers have been invited to participate in the discussion.

There are many other subjects that will be brought up, among which are:

"Loading Devices—Their Merits and Shortcomings."

"Driver's Influence on Successful Operation."

"How Manufacturer Can Co-operate with Dealer in Advertising."

"The Export Business; Best Fields and How to Develop Them."

"Motor Truck on the Farm."

It is expected that in a matter of 1 week the complete program for each day, with those handling the different subjects, will be announced.

Already the local committee here has made active progress. Headquarters and all convention sessions will be in Hotel Cadillac. The pleasure of those attending the convention is being well looked after. On Wednesday there will be a Dutch lunch with cabaret. Thursday evening the Detroit committee will tender a theatre party to all delegates. On Friday evening the official banquet will take place. Two or three well-known public speakers will attend.

Horses Twice as Dangerous as Automobiles in Chicago

CHICAGO, Sept. 15—As a part of street traffic, the automobile is safer for the pedestrian than the horse. Peter M. Hoffman, Coroner of Cook County, Ill., sets forth this fact in his biennial report on the deaths due to accidental causes in the city of Chicago, and its environs, for the year 1913. For each 5,000,000 miles traveled by motor vehicles there were 12.6 accidents as against 26.55 for horse-drawn vehicles.

In the city of Chicago and its environs, according to the report, there are 37,406 power vehicles and 65,118 horse-drawn vehicles. The daily individual mileage of these is forty-two and twelve respectively. Each day the total mileage of these vehicles collectively, is 1,571,052 miles for motor cars as against 781,416 miles for horse-drawn conveyances, or about twice as many miles for the automobile. Yet for the past 4 years accidents due to horse-drawn vehicles have averaged 4.15 daily while those due to motor cars have been 3.96.

It is clear that comparisons made as to the relative danger between horse vehicles and motor vehicles must be estimated on efficiency, and the number of miles traveled is the only rational basis on which to calculate. Therefore, in spite of their greater speed, automobiles are apparently under greater control in cases of emergency than any other form of street traffic.

Less Killed by Autos than Street Cars

Comparisons with street cars are also favorable. Of the total number of persons killed by accident in Chicago, 2.4, or 136 were traceable to automobiles, as against 2.92 or 165 by street cars. These out of an entire total of 5,648. In 1912 and 1913 automobile accidents as a cause of death were in tenth place on the Coroner's list, while street car accidents occupied sixth and eighth places respectively in those years.

If those who merely take the round figures in automobile

accidents, in Chicago, for instance, 16 deaths in 1907, 18 in 1908, 28 in 1909, 52 in 1910, 75 in 1911, 98 in 1912 and 136 in 1913, would also consider the vast mileage being made by these freight and passenger vehicles, together with the decrease in horse vehicles and the corresponding increase in the number of power vehicles, they would get a true idea of real facts and relationships involved.

The blame for 50 per cent. of all automobile accidents may be placed upon the shoulders of the pedestrians who are injured. Safety First committees are beginning to realize this, and are making great efforts to educate the public to the necessity of looking out for themselves. Of course, to safeguard all concerned, the final solution of the automobile situation in all cities must rest in great part upon the competency and efficiency of the drivers, and this problem will no doubt be gradually worked out in more or less the same way as that of locomotive engineers, who, after having been trained in the shops as firemen and proved themselves competent are granted a license and given charge of an engine.

All Should Be Licensed

At the present time, in many of the states, only hired chauffeurs are required to have licenses, whereas owners of automobiles, their sons, daughters and relatives are permitted to drive their cars at liberty through the streets without licenses. It is from this latter class of people that most accidents are reported. About 6 months ago in New York City, a girl, whose father had just bought an automobile for her, and which she had driven for a short time on one occasion, killed two people and injured three others, when she became confused and drove her car on the sidewalk. Had it been necessary for this girl to obtain a driver's license prior to her taking out her own car, this accident would never have occurred.

Motorists as a rule drive carefully. This is shown by the small number of collisions between machines. When traffic from side streets is considered, this is quite an item. Pedestrians confuse motorists many times by wavering as to which side of the street they will run when they see an automobile approaching them. If pedestrians when standing in the middle of the street were to indicate to an approaching motorist on which side to pass them, and stand where they were, accidents of the kind would be reduced to a minimum.

Even under present statistics the streets are more safe from accident than the home. Falls, over 90 per cent. of which take place in the house, are among the leading causes of accident. It would therefore seem that while the streets are not entirely free from risk, it would be well to take into consideration that the constant attention and publicity which they call forth are making them more safe every year, while other causes of serious injury and fatality are overlooked.

E. V. A. A. Now Has St. Louis Section

ST. LOUIS, MO., Sept. 11—A St. Louis section of the Electric Vehicle Association of America has been organized. C. E. Mitchell, of the Union Electric Light & Power Co., has been elected chairman; F. E. Stevens, of the Stevens-Waverly Auto Co., vice-chairman; H. V. Marshall, of the Exide Battery Depots, Indiana, secretary. Other members are: Ralph R. Doak, Woods Electric Vehicle Co.; Louis Goodhart, Milton B. Strauss and Dwight B. Blossom, of the Electric Garage and Service Co.; Harry S. Turner, Mississippi Valley Automobile Co.; C. A. Irving, Rauch & Lang Garage; Harold G. Brouster, Rauch & Lang, St. Louis Co.; Dr. Melcher Ekstromer, General Motors Truck Co.

Crude Rubber Prices Normal—Due to British Control of Sea

NEW YORK CITY, Sept. 16—"The prices of crude rubber in America are practically normal and will remain normal, so long as Great Britain retains control of the seas so that shipments of plantation rubber from Ceylon can reach New York without interference."

This sums up the present crude rubber situation as expressed today by Thos. L. Robinson, president of the Republic Rubber Co., Youngstown, O., who returned yesterday from a month's trip to England where he had occasion to make a close analysis of the crude rubber situation.

One of the most salutory conditions observed by Mr. Robinson so far as the crude rubber supply for America is concerned, is that the British rubber brokers have diverted shipments of crude from Ceylon direct to New York and have further arranged that the shippers will draw on New York direct for payment, thus leaving London and the matter of high exchange out of the transaction entirely.

Mr. Robinson thinks that there was genuine reason for the panic in American prices of crude rubber a month ago, when the war first broke out, because for a period of 2 weeks no one knew whether Great Britain had complete control of the high seas and whether shipments of rubber from the East could be counted upon. Two weeks from the declaration of war England had demonstrated her control of the high seas and immediately the uneasiness in the market ceased. The prices of crude rubber did not increase in England while they were doubling in price in New York. The feeling is general that the price of plantation crude will rather decrease than increase.

Large Mileage from 7-Inch Tires

One of the interesting aspects of the tire industry in England as observed by Mr. Robinson is the extended use of 7-inch Palmer cord tires used on such large cars as Rolls-Royce, Sheffield-Simplex and Daimler. These tires are inflated to a pressure of 110 to 125 pounds and are actually giving as high as 30,000 miles road service. The only seeming objection to them is that the high inflation pressure makes for vibration, which is not desirable. Practically all of the cars of this type are using such tires. The cost is approximately 25 per cent. over standard sizes.

At the present time the Dunlop Tire Co. in England is practically under the government control in that the government has first demand on all tire supplies. The factory is particularly busy in contrast with many of the Continental factories which have been compelled to shut down because of war conditions.

At present there are being used in Great Britain a great many steel-studded pneumatics and throughout the country are billboards advising customers to put the steel studded tire on the right rear. In America this type of tire has a very restricted following but English motorists seem to prefer it.

Wants U. S. Dollar as Exchange Basis in S. A.

NEW YORK CITY, Sept. 16—That the business men of the United States in their South American trade, have been under a handicap of from 1 1-2 to 2 per cent. each way, by reason of the expense of making payments through London, is claimed by John E. Gardin, vice-president of the National City Bank.

When asked as to the possibility of providing for direct exchange in dollars and cents, as against the present system of payment through London in pounds, shillings and pence, Mr. Gardin states that there are two factors which will enter into the establishment of a system of direct exchange in dollars between the United States and South America, namely the establishment of branches of national banks such as are permitted by the Federal reserve act, also the increase of trade with South America.

$2,870,188,575 Business Done by S. A. Countries

NEW YORK CITY, Sept. 15—The twenty Latin-American countries of Central and South America conducted in 1913 a foreign commerce valued approximately at $3,000,000,000, the exact total being $2,870,188,575. Of this total the imports were valued at $1,304,261,736 and the exports at $1,565,916,812.

Argentina, Brazil and Chili are three of the biggest importers of American goods, especially in automobiles. Brazil did a 1913 business of $795,754 from this country, its total being $4,684,069. Automobile accessories from the United States also formed a large part of its imports, amounting to $104,118, out of a total business of $534,850.

MILWAUKEE, WIS., Sept. 15—The Kissel Motor Car Co., Hartford, Wis., and the Chas. Abresch Co., Milwaukee, last week shipped fifty truck chassis and bodies to Greece for delivery to the Greek government. The bodies are regular express bodies with canopies and the chassis are of the 2 1-2-ton type.

NEW YORK CITY, Sept. 14—J. T. Ranier and P. N. Lineberger have severed their connection with the R. & L. Co., Inc., of New York City, metropolitan dealers for the Garford and Willys-Utility trucks. They have opened a temporary office at 299 Madison avenue, this city, and expect to sell automobiles and commercial vehicles.

July Exports Declined; 1914 Total $1,000,000 Less

WASHINGTON, D. C., Sept. 17—*Special Telegram*—In July, 1,315 motor cars valued at $1,249,819 were shipped abroad. During the seven months ending in July, a total of 18,942 cars valued at $16,818,422 were exported.

This shows a considerable falling off for the month. The previous month saw 2,072 cars valued at $1,991,139 sold abroad, while during July of last year 1,764 automobiles, selling for $1,736,253, were sent out of the country.

More cars have been exported during the first 7 months of this year than were shipped abroad during the corresponding period last year, but the value is less. Last year the number of cars was 17,190 as against 18,942 this year, and the value was $17,760,733 as compared to $16,818,422. This indicates an increase in the popularity of the low-priced American car.

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Rubber Goods Mfg. Co. Declares Dividend

NEW YORK CITY, Sept. 11—The Rubber Goods Mfg. Co. has declared the regular quarterly dividend of 1 3-4 per cent. on the preferred stock and a dividend of 2 per cent. on the common stock, both payable September 16 to stockholders of record, September 12.

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NEW YORK CITY, Sept. 11—The Kelly-Springfield Tire Co. has declared the regular quarterly dividend of 1 1-2 per cent. on the 6 per cent. preferred stock and 1 3-4 per cent. on the 7 per cent. second preferred stock. The dividends are payable on October 1 to stock of record, September 15.

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Registrations in N. Y. State Number 161,353

NEW YORK CITY, Sept. 14—$1,462,963.86 has been paid to New York State up to September 8, in fees for the registration of motor vehicles and chauffeurs' licenses. This is nearly $200,000 in excess of the amount contributed for the same purpose during the whole of last year.

Up to the above date, 161,353 motor vehicles have been registered. This is an increase of 36,090 over the corresponding period last year. The number of chauffeurs licensed is 61,398. During all of last year there were registered only 132,450 motor vehicles and 56,702 chauffeurs licensed.

Market Reports for the Week

This week's markets were in general more quiet and steady. The changes that occurred were the usual ones. Tin declined $1.62 per 100 pounds. There were several small sales of spot. About 3,500 tons of tin are available for September delivery. Copper was quiet and steady. More small sales of electrolytic made this week to domestic consumers, were reported. The exports of copper to Europe since September 1 were at the rate of 18,000 tons for the month. Lead rose $0.15 per 100 pounds. There is a fair demand for this metal. The crude rubber market is easier with Up-River Fine at $0.68, with no sales of any consequence noted. Shipments of rubber are coming in regularly from the various foreign ports.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.11¾	.10½	.10	.10	.10	.10	— .01¾
Beams & Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer Steel, ton	20.50	20.50	20.50	20.50	20.50	20.50	.....
Copper, Elec., lb.	.12¼	.12	.12	.12⅛	.12⅛	.12⅛	— .00⅛
Copper, Lake, lb.	.12	.12⅜	.12⅜	.12¼	.12¼	.12¼	+ .00¼
Cottonseed Oil, bbl.	5.82	5.86	6.03	5.80	5.80	5.88	+ .06
Cyanide Potash, lb.	..	..	..	.32	.32	.32	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	3.70	3.70	3.85	3.85	3.85	3.85	+ .15
Linseed Oil	.60	.60	.60	.60	.60	.60	.....
Open-Hearth Steel, ton	20.50	20.50	20.50	20.50	20.50	20.50	.....
Petroleum, bbl., Kans., crude	.75	.75	.75	.75	.75	.65	— .10
Petroleum, bbl., Pa., crude	1.45	1.45	1.45	1.45	1.45	1.45	.....
Rapeseed Oil, refined	.82	.82	.82	.82	.82	.82	.....
Rubber, Fine Up-River, Para	74	.73	.73	.69	.69	.68	— .06
Silk, raw, Ital.	..	..	..	..	..	..	.....
Silk, raw, Japan	..	..	..	..	..	..	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	33.00	32.75	32.00	31.50	31.50	31.38	—1.62
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

Ajax-Grieb Fiscal Year Greatest in History

NEW YORK CITY, Sept. 10—With the close of August the fiscal year of the Ajax-Grieb Rubber Co. came to an end, showing a greater volume of business done than ever before in the history of the company. This, despite the fact that in November there was a 28 per cent. decrease in tire prices, a difference which had to be made up before any gain could be shown. Furthermore, the Ajax was one concern not to make any advance in prices when the European war began. It has not yet announced any such new schedule, and will not as long as its supply of crude rubber, bought at before-the-war prices, lasts.

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A 10 Per Cent. Pope Creditors' Dividend

HARTFORD, CONN., Sept. 12—Judge Joseph P. Tuttle of the superior court issued an order this week authorizing Receiver Colonel George Pope, of the Pope Mfg. Co., to pay a dividend of 10 per cent. on the claims allowed. The receiver represents that he has sufficient funds to pay a 10 per cent. dividend on disallowed claims if they are eventually allowed. Receiver Pope has been authorized to turn over to the Massachusetts receiver old bicycles and tricycles which made up the Pope museum in this city. The allowed claims aggregate approximately $1,600,000.

In the United States court at Boston Pope claims to the extent of $1,641,382 have been allowed. The allowed claims include those of the noteholders. Claims to the extent of $157,365 are to be referred to a master and included in these are the claims of the officers of the Pope company, $44,537 for Albert L. Pope, $30,153 for Charles E. Walker, and $26,802 for Wilbur C. Walker.

No offer has been made yet for the Massachusetts property at an upset price.

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Heavy Printed China Duty for Plug Porcelains

NEW YORK CITY, Sept. 15—The Champion Ignition Co., Detroit, Mich., lost in a protest over the rate on porcelain insulators for spark plugs. The insulators had printed letters and numbers on their fronts, and for this reason the customs collector classified them as printed china with duty at 55 per cent. The importer claimed that the lettering was merely to protect patent rights.

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Reo Declares Extra 12½ Per Cent. Dividend

LANSING, MICH., Sept. 12—At a meeting of the stockholders of the Reo Motor Car Co., this city, R. C. Rueschaw, general sales manager, was elected to the board of directors. In addition to the regular quarterly dividend of 2 1-2 per cent., an extra dividend of 12 1-2 per cent. was declared, payable October 1, to all stockholders of record at the close of business September 20.

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Seven More White Trucks for Post Office

WASHINGTON, D. C., Sept. 14—The Post Office Department has awarded contracts for seven trucks to the White Co., Cleveland, O. The capacities are as follows: Five 1,500-pound trucks at $2,050; one 3-ton truck, $3,445, and one 1.5-ton truck at $2,825. These seven, together with the twenty purchased from the White Co. a year ago, make a total of twenty-seven of these vehicles at present owned by the department. The twenty purchased a year ago are in use in postoffices in five or six different cities.

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Knox Sells Five Tractors to Europe

NEW YORK, Sept. 16—Direct results of the European war on the motor truck business in America has been demonstrated this week when the Knox company sold five 5-ton tractors to one of the foreign governments. These tractors are being shipped this week. For the past week emissaries of other foreign governments have been in America looking for motor trucks. There seems to be a demand for approximately 650 trucks of from 2 5 to 3-ton capacity, these being practically on a par with the subsidized trucks in the majority of the European countries. In addition there is talk of buying 250 trailers with approximately 750 wagons to go with them. Other lines of merchandise being purchased include 6,000,000 horseshoes, 400,000 army blankets, and 100,000 horse blankets.

Ford's Home Trade Growing; Locates Four New Branches

Profit-Sharing Announcement Has So Boomed American Sales That War Constriction Has Not Been Felt

DETROIT, MICH., Sept. 10—Beginning October 1, there will be four new Ford branches in the United States, bringing the total number of branches up to forty-eight. These new branches will be located in Milwaukee, Wis., 143 Eighth street, A. W. L. Gilpin, manager; Newark, N. J., 1721 Halsey street, E. T. Baskett, manager; Charlotte, N. C., A. J. Langford, manager; and Brooklyn, N. Y., 1476 Bedford avenue, G. E. Hunt, manager.

Besides these forty-eight branches the Ford Motor Co. now has twenty-four assembling plants and 5,600 dealers in the United States. Including the whole world there are about 8,000 dealers. There are seventeen branches located in foreign lands and two Ford factories outside of America, these being the Walkersville, Canada, plant and the one in Manchester, England, where probably 15,000 cars are made now annually. This English plant supplies the British Isles only, that is, England, Ireland, Scotland and Wales.

The Ford plant in Walkerville, Ont., supplies the British colonies and the Canadian trade. Europe's requirements, excepting those for the British Isles, have been taken care of from the main plant here in Detroit.

While the exact figures are not given, it is safe to say that at least 10 per cent. of the 1914 output was shipped to Europe and this totals about 24,000 cars. To France alone at least 5,000 cars were shipped, and during May, according to H. P. White, continental manager, 500 cars were sold in France. The business in Russia figured at between 4,000 and 5,000 cars for the year. In most all other European countries the sales have been heavy this year.

Although the export trade to Europe is necessarily small at present, and will remain so for some time, there is no intention to cut down its proposed output of 300,000 cars for 1915. As a matter of fact, it is stated that since the profit-sharing scheme went into effect the demand has been so heavy that it will be somewhat difficult to supply all the dealers with the number of cars they desire.

200 Hupmobiles in New York Reunion

NEW YORK CITY, Sept. 15—More than 600 persons in nearly 200 Hupmobiles participated in a Hupmobile reunion which was promoted by Chas. E. Reiss, New York Hupmobile distributor, on Wednesday afternoon, September 9. The cars were formed in line at 130th street and Riverside Drive and, headed by Reiss in one of the new 1915 models, proceeded to the Hotel Shelburne, Coney Island. At the hotel Reiss' guests were lined up for a photographer, after which a banquet was served. Chas. E. Buck, assistant advertising manager of the Hupp Motor Car Co., acted as toastmaster. A tall silver Hupmobile cup, presented by Reiss for a dancing contest, was won by Dr. H. W. Taylor and Miss Nockler. Dr. Taylor has been a Hupmobile owner only about 6 months.

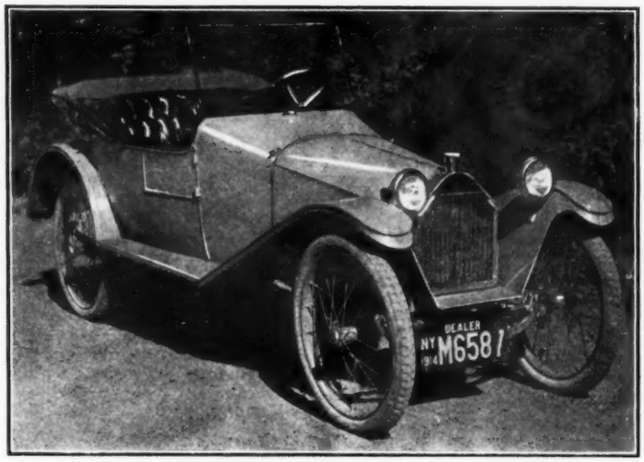
Pierce-Arrow Agents in Session

BUFFALO, N. Y., Sept. 15—The first annual convention of agents and salesmen of the Pierce-Arrow Motor Car Company opened here yesterday forenoon in the factory of the company in Elmwood avenue. About 60 agents and salesmen are in attendance at the meeting which continues until Wednesday evening. An interesting program has been arranged by the Pierce-Arrow people which includes considerable entertainment for the delegates.

Officers of the company will read interesting papers touching on the vital subjects of the day in the automobile industry. As the Pierce-Arrow factory is behind in its deliveries, causing a scarcity of cars, arrangements were made with the International Railway Company for a special car to transport delegates to and from the factory. After business hours two banquets, theater parties and various other entertainments were on the program.

Coffin Added to Patents Committee

NEW YORK CITY, Sept. 14—Howard E. Coffin, vice-president of the Hudson Motor Car Co., Detroit, Mich., has been appointed a member of the patents committee of the National Automobile Chamber of Commerce. With him on the committee are C. C. Hanch, Marmon, chairman; Wilfred C. Leland, Cadillac; Windsor T. White, White, and W. H. VanDervoort, Moline.



Remington roadster with electric equipment and automatic gearshift

New York Show Space Drawing, Oct. 8

NEW YORK CITY, Sept. 11—The National Automobile Chamber of Commerce has voted that the automobile shows in January shall be invitation affairs to which will be invited such concerns in the automobile and accessory industry as can be cared for properly.

Allotment of space will be confined to members of the N. A. C. C., to members of the Motor and Accessory Manufacturers, the Motor Cycle Manufacturers' Assn. and the Electric Vehicle Manufacturers' Assn., and to such other persons and companies as may be formally invited by the management to participate.

All applications for space must be in hand by October 3 to participate in the first allotment. The drawings for space for both shows will take place at the offices of the N. A. C. C. on October 8, in connection with the semi-annual meeting of that organization.

The show committee will again be George Pope, of the Pope company, W. C. Leland, of the Cadillac company, and H. O. Smith, of the Premier company.

The Chevrolet Motor Co., Flint, Mich., has been admitted to membership in the association. The N. A. C. C. now includes ninety-two automobile manufacturers.

TACOMA, WASH., Sept. 7—For the automobile exhibit at the Oregon State Fair at Salem, Ore., September 28 to October 3, space has been set aside to accommodate fifty cars. Both trucks and pleasure cars will be exihibited and it is expected this will bring numerous buyers from all parts of Central Oregon. The exhibit will be staged by Joseph M. Rieg.

New Small Velie Six at $1,595

NEW YORK CITY, Sept. 15—An entirely new small six selling at $1,595 and called the Biltwel series 15 is the feature of the line of the Velie Motor Vehicle Co., Moline, Ill., for the ensuing season. Last season's small four, the model 11 has been discontinued and the big six, called series 14 this year and the big four called series 12, have been improved and reduced in price. The four has been reduced, from $2,000 to $1,750, and the six from $2,350 to $2,015. New bodies are featured on all the cars. In the new small six the Velie company has incorporated a number of special features which have lately come into use by motor car builders. The spiral bevel rear axle gears is one of these features, the tapered frame, another.

Show Building for St. Louis Accessory Trade?

ST. LOUIS. MO., Sept. 10—At a dinner-meeting of the St. Louis Motor Accessory Trade Association, the Continental Auto Equipment Co., was elected a member of the association. T. L. Hausmann was appointed chairman of the show committee. There was a discussion concerning the securing of an auditorium for show purposes in St. Louis, just as one was obtained by the Kansas City and Denver dealers. There will be another meeting within a short time at which all interested in the automobile and accessory trade in this

city will be asked to attend to give their views, so that active work may be started in the endeavor to secure an auditorium.

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One Car in Every Twelfth Wisconsin Family

MILWAUKEE, WIS., Sept. 12—There are now fully 50,000 automobiles owned in the State of Wisconsin, 36 per cent. belonging to farmers and 64 per cent. owned in cities and towns.

According to the schedule of the assessors in forty-one counties considered the agricultural districts, and not including Milwaukee county, as the latter's city population represents 97 per cent. and the rural population only 3 per cent., it is shown that one farmer's family in every twenty-two owns an automobile, and the proportion is one to twelve for the city family. In Milwaukee county one in every fifteen farm families owns a motor car and one in every sixteen city families. In Walworth county, considered the richest, one farmer in every nine owns a car. In that county the average value of a farm is $13,000, while in Shawano countv the average value of a farm is only $6,000 and only one car is to be found to every thirty-seven farms.

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Blair Co. to Make Trucks Only

NEWARK, OHIO, Sept. 10—Steps are being taken toward a complete reorganization of the Blair Mfg. Co., under the title of the Blair Motor Truck Co., which was recently chartered under the laws of Ohio. To facilitate the reorganization all of the assets of the concern have been deeded to Carl Norpell, trustee, for $15,000 and other considerations. The old concern will remain in business long enough to close up its affairs and dispose of its finished agricultural implements.

In the future the product will be restricted to motor trucks. The truck is equipped with a patent direct drive. A number of the old stockholders will be interested in the new corporation.

The company is now building a 5-ton double deck truck for passenger service in Philadelphia.

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A $495 Car with Automatic Gearshift

NEW YORK CITY, Sept. 15—The Remington Motor Co. will manufacture a two-passenger roadster selling at $495, with electric lighting and starting and full equipment. An automatic gearshifting device is a feature of the car.

The car is built on conventional lines, but on a small scale, the wheelbase being 100 inches, the tread 42 inches and the weight between 750 and 800 pounds.

A four-cylinder L-head block-cast 2 3-4 by 4 1-2 motor is a unit with the three-speed gearset and the inverted cone clutch, the unit being on a three-point suspension. Lubrication is by splash with pump circulation, cooling by the usual method with circulating pump, and ignition by the Atwater Kent system with automatic spark advance.

Drive is through a propeller shaft with two leather universals, bevels and a four-pinion differential to the three-quarter floating rear axle. A pressed steel torque member is used. Wire wheels are regular equipment, but wood wheels will be furnished as an option. Tires are 28 by 3. The front spring is a transverse semi-elliptic and the rear springs three-quarter elliptics. Steering is by worm and sector gear, adjustable, with a 15-inch wheel. Service brakes are metal to metal, running in oil, consisting of two bands enclosed in the differential housing and adjustable from the outside; the emergency brakes are on the hubs in the usual way.

The equipment includes top, side curtains, windshield, speedometer, electric horn, electric starting and lighting system with headlight dimmers, and the usual tools. The body (only one style is built) is of steel with tapered hood and, in fact, big car lines throughout. The color is gray, with black striping.

The Remington Motor Co., this city, has opened offices and salesrooms at 2 Columbus Circle, and has completed arrangements for the erection of a factory at Rahway, N. J. A temporary factory has been secured for the production of the first lot of cars, which will be ready for delivery in November.

P. E. Remington is the moving spirit and vice-president of the company. B. B. Monypeny is president; J. T. Macgregor, treasurer; C. W. Bliss, secretary, and C. P. Hollister, chief engineer. Messrs. Monypeny, Remington and Macgregor, with James Barber, William Grant Brown and R. T. McKee form the board of directors. The company was incorporated in June under the laws of the State of New Jersey with a capital of $500,000.

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Enger Brings Out a $1,495 Six

CINCINNATI, O., Sept. 12—A new six-cylinder car has been brought out by the Enger Motor Car Co., Cincinnati, O., to sell for $1,495 with complete equipment, including electric lighting and starting; a single model is offered, six- or a seven-passenger touring car with a wheelbase of 124 inches and 34 by 4 tires.

The motor is block cast with cylinders 3 1-2 by 5, giving a S. A. E. rating of 29.4 horsepower; valves are enclosed. Ignition is by the Atwater Kent system with both automatic and manual spark control.

Electric lighting and starting are provided for by a separate generator and starting motor. The cooling water, pump circulated, passes through a square-tube honeycomb radiator. The carbureter is a Rayfield.

Power is transmitted through a multiple-disk clutch and three-speed gearset, forming with the motor a unit power plant, and propeller shaft to the floating rear axle. Wheels are of wood with Firestone demountable rims carrying 34 by 4 Firestone tires. Front springs are semi-elliptic and rear springs three-quarter elliptic.

The equipment consists of one-man top, quick adjustable curtains, windshield, electric horn, Stewart-Warner speedometer, extra rim and the usual tools, etc. A gasoline gauge is mounted on the dashboard, and, with the other instruments, is electrically illuminated. A dash adjustment for the carbureter is provided to make starting easy in cold weather.

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Sphinx Co. Buys Hart Kraft Plant

YORK, PA., Sept. 12—The Sphinx Motor Car Co., York, Pa., has purchased the building formerly owned and occupied by the Hart Kraft Motor Car Co. and is manufacturing cars. Deliveries will be made October 1.

The dimensions of the property are 115 by 265 feet, and is located along the Pennsylvania and Western Maryland Railroads. 'The four-story building affords ample room for the production of 5,000 automobiles annually.

The style of the car will be a light touring car, fully equipped, including electric lighting and starting systems, at the selling price of $695.00.

Herbert R. Averill and Ernest T. Gilliard will have the management of the factory. The following will be directors: Howard Rohrer, Jacob Rohrer, Lancaster, Pa.; Theo. C. Auman, Milton G. Hollis, Reading, Pa.; Dr. Posey, York, Pa.; Dr. Otto Schaefer and Thomas C. Goodwin, Baltimore, Md.

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Studebaker Supplies Extra Coupe Bodies

DETROIT, MICH., Sept. 9—The Studebaker Corp. is furnishing Studebaker dealers and branches with coupé bodies which can be mounted on almost any chassis. As the Studebaker is not made with closed models, this will meet the demand of patrons who desire a closed car for the winter.

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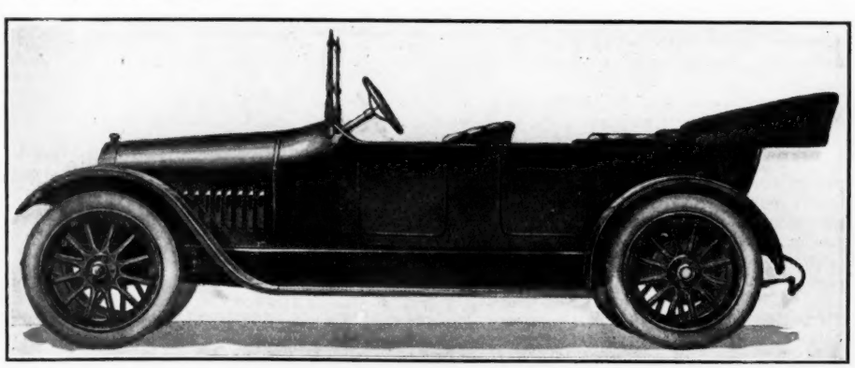
Stutz Light Four Runabout, $1,475

NEW YORK CITY, Sept. 16—The price of the new light four Stutz runabout is $1,475 with full equipment and not $1,450 as was stated in THE AUTOMOBILE for September 3 on page 468.



New seven-passenger Enger $1,495 light six

Buick Wins Wisconsin 500-Mile Reliability

MILWAUKEE, WIS., Sept. 11—Repeating his brilliant victory in the first Wisconsin reliability tour in 1910, Emil Hokanson, Madison, Wis., driving a Buick model C-37, captured two out of three trophies in the fourth annual Wisconsin reliability-economy tour, run over a course of 508.8 miles on September 7, 8 and 9, and might have taken the third cup but for the fact that six contestants drew lots for it. Franklin, Jeffery, Studebaker, Chevrolet and R. C. H. finished in the order named.

Buick Wins Economy

By averaging 24.8 miles per gallon of fuel, which figures 1,455 pounds per gallon, Hokanson's Buick won the economy test, and with a score of 2,995 out of a possible 3,000, was awarded also the $1,000 sweepstakes cup. A trophy, for best road score, was awarded to the Studebaker 4, the decision being made by drawing lots because all contestants finished with perfect road scores.

It was with a model 19 Buick that Hokanson won the cup in the initial tour for this trophy in July, 1910. In 1911 Hokanson finished second, and in 1912 he was tied with several other contestants for the major trophy and with the others received certificates instead of the cup. There was no tour in 1913.

Franklin Wins in Owners' Division

In the private owners' division, John D. Babcock, of Milwaukee, driving a 1911 Franklin 6, won over Henry O. Stenzel in a White 30, and becomes permanent possessor of the Emil Schandein trophy by virtue of having won the cup three times. Stenzel has been Babcock's competitor in this division since 1911 and tied the Franklin in 1912. This division was run under grade 3 rules of the A. A. A. and Babcock finished with a perfect score, while Stenzel suffered 31 points penalty for taking on water between controls and for work on a water connection.

The 1914 Wisconsin state tour was without doubt the most important run of the kind staged in America this year. The addition of an economy test made it the most important tour ever held in the country, for reliability has long since been proven, while economy has until now been a matter of guesswork.

Fuel Carefully Measured

For the purposes of the economy test, all gasoline tanks were emptied and filled with a supply of Bartles-Maguire 60-62 degree gasoline, carefully measured by pints, and all replenishment of gasoline supply during the run was as carefully measured and noted by the technical committee, under whose supervision all tanks were drained at the conclusion of the run and total consumption noted. All cars finished by 6 o'clock Wednesday, September 9, and were then returned to the official garage and kept locked up until Thursday morning, when brake, clutch and transmission tests were held. Immediately thereafter the technical committee tore down each car for final examination and was able to report to the contest board late Thursday that the Buick was entitled to the *Sentinel* and Wisconsin Motorist trophies and all cars were tied for the Milwaukee *Free Press* trophy.

All Were Penalized

As is shown in the report of the technical committee, not one car came through the exacting final examination without demerit. However, it can readily be seen that the majority of penalties thus assessed were of a minor character and proves the contention of many that the reliability of modern motor cars under the most exacting conditions cannot longer be questioned.

Each contestant started out with a credit of 3,000 points, divided into three sets of 1,000 points each, as follows: Road score, technical score, and economy score. The winning Buick lost only 5 points, which were assessed in the final examination, but for minor faults. The Franklin, Jeffery and Studebaker lost only 3 points each in the final inspection. The Chevrolet, which went into the technical committee's hands with a small fracture in the water jacket, was assessed 36 points for the fault, which was aggravated by the 500-mile run. The new R. C. H. suffered the heaviest technical penalties, being listed for a deduction of 159 points from its 3,000 for a net 2,790. The left rear axle shaft was broken, causing 100 points, and both sets of brakes failed to come to scratch, causing 50 more points to be added to the penalty.

Fuel economy was determined by dividing the total weight of the fuel consumed on the entire trip into the weight of the car, including passengers, driver, observers, tools, equipment, and everything complete as the car went over the roads in the tour.

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Burman Sets World 15-Mile Record in 12:47

PEORIA, ILL., Sept. 12—Bob Burman today established a new world's record when he drove 15 miles on a circular dirt track in 12:47. The old record was 13:30, made by Disbrow at San Jose, Cal., April 14, 1912. Disbrow's mark of 13:03 for the same distance made at Hamline, Minn., Sept. 12, is also broken.

Burman's attempt today was in an official time trial.

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64 Mile Average in Spokane Road Race

SPOKANE, WASH., Sept 10—Eight cars entered the 21-mile automobile race Labor Day on the course at Spokane, Wash., known as the Apple way.

The winner was a 50 horsepower Stutz car owned by Harlan Peyton and driven by Herb Alderson, who has captured many road and track races in the Northwest.

Ed McGoldrick's National was forced to retire by a broken drive shaft at the start of the race and Roy Nobel's Detroiter went into the ditch on the return lap.

Alderson drove the powerful car over the 21 miles of country road at an average of 64 miles an hour.

The little red Detroiter was racing neck and neck on the first mile of the return lap with Claude L. Laws's Hudson when he met with an accident which put him out of the race. The Hudson skidded and locked front axle hubs with the Detroiter. The latter was catapulted off the road by the shock, but landed right side up, both driver and mechanic escaping any serious injury.

Another car which had hard luck was Ray Paulsen's Lozier, which developed engine trouble on the first half of the lap.

A driving rain fell throughout the first part of the afternoon. In spite of weather conditions about 3,000 people saw the races. The course began 1 mile east of Spokane and ended at Liberty Lake Junction, a distance of 21 miles. The road was in perfect condition.

The winners of the race received a first prize of $210; $126, second; $84, third. Following is summary:

21 Miles Free For All	Out	Back	Round Trip
Stutz (Alderton)	10:14	9:27	19:41
Everett (Cunningham)	11:12	9:42	20:54
Hudson (Laws)	10:49	10:30	21:19
Chalmers (Schmidt)	11:45	9:51	21:36
E. M. F. (Morrill)	12:00	10:28	22:28
Lozier (Paulsen)	16:38	9:37	26:15

Faster time made on the return trip was due to the fact that the rain had stopped, permitting the drivers to follow the road more easily. Other events and results of smaller races on the Apple way, were, as follows:

100-Yard dash, three gear shifts—Won by Joe Stenstrum, Chalmers Six; time, 12 4-5 seconds. Dr. Hahn's Lewis six, second; J. A. Raymer's Hudson six, third.

100-Yard race, low speed on high gear—Won by A. D. Jones' National; time, 1 minute and 14 seconds; Verne Dempsey's Chalmers, second; H. A. Fletcher's Lozier, third.

Tire change followed by 100 yard dash—Won by Roy Nobel in Detroiter; time, 2 minutes and 8 seconds; Cunningham's Everett, second.

100-Yard race from start with dead engine—Won by D. R. Riegel's Detroiter; time, 14 seconds; Fletcher's Chevrolet, second; Smith's Hupmobile, third.

In the tire changing event the Detroiter's driver and mechanic stole a march on their competitors by dispensing with the use of a jack, raising their light car by hand to put the tire in place.

During the big race the course was patrolled by national guardsmen stationed at every crossroad to warn vehicles. Some criticism was elicited, however, by the failure of officials to keep the crowd from the track near the start of the race.

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30 by 3-Inch Tire, $6.75

NEW YORK CITY, Sept. 16—In an advertisement in THE AUTOMOBILE in the issues of August 27 and Sept. 3, it was stated that the price of the 30 by 3-inch tire advertised by the Fire Sales Co., 1334 Arch street, Philadelphia, Pa., was $5.75 when the price is $6.75.

Eight Cylinder Motors for 1915

(*Continued from page* 428)

being placed directly above the camshaft. The generator runs at camshaft speed. At the rear end of the generator is the train of gears which mesh with the teeth in the flywheel rim for cranking purposes. These gears are not in mesh unless the starter pedal is depressed, and the reduction between electric motor speed and engine speed is 25 to 1. The Delco unit temporarily becomes an electric motor in the usual way of cranking.

Wheelbase 2 Inches Longer

The Cadillac changes this year are not all in the motor, for the chassis is altered considerably also. The wheelbase has been lengthened from 120 to 122 inches, while left drive and center control replace right drive and control. The hinged steering wheel, which was an innovation last season, has been retained.

In the transmission system, a big alteration appears in the incorporation of the gearset in unit with the motor instead of locating it amidships as heretofore. The same type and design of three speed sliding gearset is used, however. The cone clutch has also given way to a nicely designed disk clutch of the dry plate type. This has fifteen carbon steel plates 7 3-4 inches in diameter, the driving plates, eight in number, being faced with wire mesh asbestos. This construction has resulted in an exceedingly soft-acting clutch.

The drive shaft back to the axle continues to be of the unclosed type, fitted with two universals and being paralleled by a triangular torque arm.

A floating type rear axle which is similar in general construction to that formerly used is employed. This axle is, however, of the latest form in that worm bevel gears replace straight bevels for the ring gear and driving pinion.

Spiral Bevel Rear Axle

The spiral bevel gearing which appeared last year provides a rolling contact along the teeth and this is conducive to smooth running and quietness. It is looked upon as the last word in rear axle drive refinement, and in order to generate these complicated gears, the Cadillac company has installed an elaborate equipment of machines which give a movement of the cutter with respect to that of the gear blank itself in exceedingly complicated fashion. Very close limits of accuracy are obviously necessary in generating such teeth.

In other respects the chassis is about as it was. The frame is of bottle neck form, 33 inches wide in the rear and 30 at front. The characteristic Cadillac platform rear spring suspension is retained and its easy riding qualities are commendable. The gasoline tank is at the rear with pressure feed to the carbureter. Tires are 36 by 4 1-2 inches on demountable rims and wood wheels.

It is a notable fact that the new Cadillac is much lighter than its predecessor.

Bodies for 1915

Bodies have come in for little change, being of the smooth sided type with present-day lines gracefully worked out. The usual array of closed types is offered, while in addition to roadster and five- and seven-passenger touring types, a four-passenger salon, of open car design, is an attractive member of the family. This car provides a passageway to the rear seat and between the individual front seats. There is only one front door to it.

As regards prices, there has been no change made. Nineteen seventy-five is asked for any one of the open models, while the usual increases are required for the closed line. Equipment is complete in every detail.

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Headlight Committee Appointed by Indiana S. A. E.

INDIANAPOLIS, IND., Sept. 15—*Special Telegram*—At the monthly meeting of the Indiana section of the Society of Automobile Engineers, held in the rooms of the Hoosier Motor Club, of this city, a committee composed of Howard C. Marmon, Nordyke and Marmon Co., George A. Weidely, Premier Co., and J. W. Esterline, Esterline Co., was appointed to take up with a committee from the Hoosier Motor Club, the matter of non-blinding headlights. These committees will act with the city and state officials.

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NEW YORK CITY, Sept. 15—At a meeting of the Contest Board of the American Automobile Assn. held today, Wm. Schimpf, who held the position of chairman of the board for 2 years, 1912-1913, was presented with a gold watch by the contest board in recognition of his services.

At today's meeting Hughie Hughes and Ray F. Brock were suspended for 2 years for failure to live up to contracts with promoters requiring their appearance at races.

Two records were officially allowed, one 100-mile for dirt tracks made by Ralph De Palma, in a Mercedes, at the Labor Day, Brighton Beach meet; time 1:40:15. The other was a 25-mile record established by Percy Barnes in a Romano car at Portland, Ore., July 12; time 22:07 1-5.

The Automobile Calendar

Sept. 15-Oct. 11...New York City, Commercial Tercentenary Celebration.
Sept. 23-Oct. 3...Oklahoma City, Okla., Show, Oklahoma Automobile Association.
Sept. 26.....Kalamazoo, Mich., 100-Mile Track, Inter-State Fair.
Sept. 27.....Pleasanton, Cal., Track Meet, Alameda County Fair Assn.
Sept. 28-Oct. 3...Salem, Ore., Automobile Show, Oregon State Fair.
Oct. 3-10.....Cincinnati, O., Show.
Oct. 3.....Fresno, Cal., Track Meet, Fresno Co. Agricultural Assn.
Oct. 4.....St. Louis, Mo., Automobile Show, Auto Manufacturers' and Dealers' Assn.
Oct. 5-12.....St. Louis, Mo., Show, Forest Park Highlands
Oct. 7-8-9-10.....Detroit, Mich., First Truck Convention of Motor Truck Manufacturers', Dealers' and Owners' Organization; promotor, Motor Truck Club of America.
Oct. 7-17.....New York City Electric Vehicle Show, Grand Central Palace.
Oct. 10.....Medford, Mass., Track for Light Cars, Combination Park.
Oct. 10-17.....Boston, Mass., New England Light Car and Cyclecar Show, Horticultural Hall.
Oct. 17.....Los Angeles, Cal., Show, Shrine Auditorium.
Oct. 17-24.....Pittsburgh, Pa., Automobile Show, Auto Dealers Assn., Inc.
Oct. 17-Nov. 1....Dallas, Tex., Show, State Fair Grounds, Dallas Automobile Dealers' Assn.
Oct. 19, 20, 21....Philadelphia, Pa., Elec. Veh. Assn.'s Convention.
Oct. 19-26.....Atlanta, Ga., American Road Congress of the American Highway Assn. and the A. A. A.
Oct. 28-31.....Milwaukee, Wis., Convention, Northwestern Road Congress, Auditorium.
Nov.....El Paso, Tex., Phoenix Road Race, El Paso Auto Club.
Nov. 8-9.....El Paso to Phoenix, Ariz., Automobile Race.
Nov. 8-11.....Shreveport, La., Track Meet, Shreveport Auto Club.
Nov. 26.....Corona, Cal., Road Race, Corona Auto Assn.
Dec. 1-4.....New York City, Annual Meeting of the American Society of Mechanical Engineers.
Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace.
Jan. 3-10.....Buenos-Aires, Argentina, Grand Prize of Argentina.
Jan. 9-16.....Philadelphia Automobile Show.
Jan. 23-30.....Chicago, Ill., Automobile Show, First Regiment Armory.
Jan. 30-Feb. 6....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition
Mar. 7.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.

Accessories for the Automobilist

GERMAN - AMERICAN Aluminum Solder—To dispense with the present oxy-acetylene method of repairing fractures in aluminum parts is the object of the German-American Aluminum Co. which has just established a sales office at 25 West Forty-second street, New York City.

The new solder is the invention of Karl R. Peters, a metallurgist of Berlin, Germany, and at the present time it is being manufactured in this city as well as in that country. The inventor claims that no breaks are too complicated to be repaired by the new method and that the work can be done at a saving of at least one-third the cost of the welding job. The strength of the solder, according to Mr. Peters, is about double that of aluminum as regards its resistance to tensile strains and even greater as regards its resistance to bending.

Outside of the greatly reduced cost of making the repair, it is claimed that the work attached to the job is no more than in ordinary soldering. Instead of having to purchase an expensive welding outfit, in the nature of oxygen tanks, acetylene and welding jets, the ordinary gasoline torch can be used. Another advantage claimed by the German-American company for its product is that the work requires no machining after the soldering is run in place.

In performing the work on an aluminum casting that has been broken into a number of pieces, the various parts are matched as closely as possible and screwed down on a jig. The fractures are then chiselled in the form of a V-shaped slot in the same manner as for a welding job. The solder, which melts at a temperature of 400 degrees Fahrenheit, is then run into the slot and finds its way down into crevises between the two pieces of metal. Upon solidifying the joint is made.

Mr. Peters states that he has had 8 years' successful experience with his solder both in this country and abroad. It is a secret composition, containing eight ingredients, five of which are metals and the other three salts of metals. The German-American company will either do the repair work itself at its factory at Port Jefferson, Long Island, or will sell the solder, together with territorial rights and instructions for its use in garages and repair shops. A guarantee is made that regardless of the work to be performed that the aluminum will break before the soldered joint under any ordinary strain.

Geschwa Shock Absorber—A combination spring and pneumatic shock absorber is shown in Fig. 1. The spring is a spiral type and it is situated in the top of the casing, while at the bottom is the piston and compressed air chamber.

The instant a primary jolt or shock is transmitted to the body springs of the car, the flat spiral coil spring of the absorber compresses in proportion to the extent of the jolt or shock and draws up the hanger and piston of the absorber from the bottom of the cylinder. The cylinder then takes in air on the principle of an air pump. On the rebound, which is the downward stroke of the hanger and piston, the air gradually is expelled through the relief hole at the bottom of the cylinder. Each rear set has four relief holes which control and check the excessive recoil and absolutely eliminate the series of oscillations occurring directly after spring expansion, it is claimed.

The shock absorbers are made in three sizes costing $45, $50 and $60 per pair. They are sold by the Marolin Co., 30 Church street, New York City.

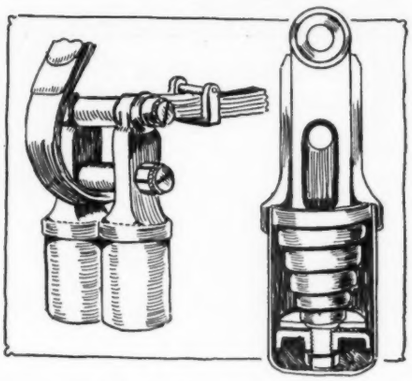

Fig. 1—Geschwa shock absorber. The air piston takes the rebound

Bench Machinist—A combination lathe, drill press and milling machine is shown in its various roles in Fig. 2. It is made by the Hunt Engineering and Sales Agency, 320 Lissner Building, Los Angeles. This machine is adapted to all kinds of small machine work—boring, turning, threading, milling, drilling and tapping, at any angle; die-sinking and routing. The universal feature of this machine is obtained by means of swinging the spindle—in the vertical position it rotates the drill; in the horizontal position it drives the face plate or lathe chuck or the milling cutter.

The spindle is driven through a three-step cone pulley and telescopic shaft, with two universals. In the head are two bronze mitre gears, and the spindle passes through one gear with a feather key. The power-feed screw is actuated by a train of spur change gears on a radial arm which engages either with the end of the spindle when in a horizontal position or with a special worm gear attachment driven from the cone pulley which is furnished with the machine when desired.

As a drill, the work is clamped to the table and by the use of cross and longitudinal feeds is adjusted to any desired position. For drilling and tapping at any angle, the spindle may be adjusted and the work brought to the tool. The capacity of the drill is ½ inch.

As a lathe, the spindle is horizontal. The face plate is 5 inches in diameter, but much larger work than this may be swung. As the head is adjustable to any angle, any taper may be cut. If a tail stock is required a dead center may be attached to the extension arm, as when used as a milling machine.

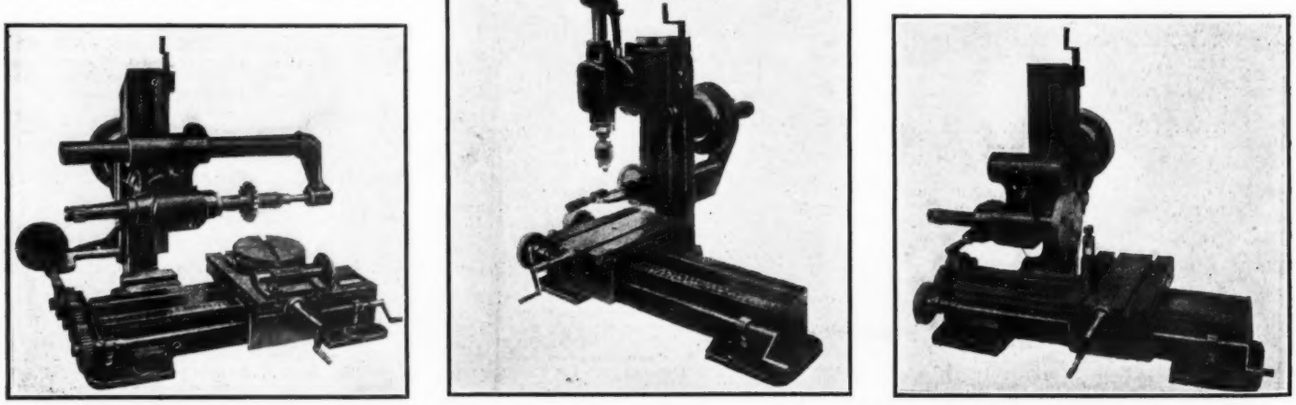

Fig. 2—Bench machinist which combines many machine tools in one. At the left is the device set up as a milling machine; in the center it is a drill press and at the right it takes the form of a lathe. The universal feature is obtained by means of swinging the spindle. It is made by the Hunt Engineering and Sales Agency, Los Angeles